

**R E A**

**DIVISION COMPOSANTS**

**OPTREX**

**RADIO EQUIPEMENTS ANTARES**

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**DMC Series**

OPTREX's Dot Matrix Liquid Crystal Display Module DMC Series can easily be connected to a micro computer by using LSI s which contain sophisticated control circuits, character generators, etc.

DMC Series is most suitable for use with micro computer peripheral, word processor, POS terminal and telecommunication systems etc.

**<Features>**

- (1) 8-bit or 4-bit MPU interface is available.
- (2) 160 JIS type characters such as Alphabet, Numeral and Kana and 32 special characters and symbols can be displayed by internal character generator (ROM).
- (3) Random symbols can be displayed by character generator (RAM).
- (4) Many instructional functions by means of program such as "clear display", "home cursor", "on/off cursor", "blink character", "shift display", "shift cursor", "read/write display date", etc. are available.
- (5) Compact and light weight design enable easy assembly on device.
- (6) Single "+5V" power supply (Standard Type)
- (7) Low power consumption

**APPLICATIONS**

- Personal Computer
- Electronic Typewriter
- Word Processor
- Facsimile
- Plain Paper Copier
- Telecommunication Systems
- Instrument Devices
- POS Terminal
- Other Peripherals

**DMF Series****<Features>**

With a liquid crystal display of an excellent characteristics and reliability, OPTREX has developed the "DMF Series" for large scale graphic display. These are exceptional in the following good points,

- (1) Low voltage operation, Low power consumption.
- (2) Small-sized, Light, Thin.
- (3) Figure display, and Character as well.
- (4) High contrast, Wide viewing area.
- (5) Large scale display as CRT.

The above 5 points are a part of presentation.

As an ideal usage, OPTREX "DMF Series" are winning good reputation on equipments of Personal computer, Word processor, Sequence controller, Process controller, Oscilloscope and other peripheral equipment.

## DMC Series

Type No.	Display Format	Display Fonts	Module Size (W×H×Tmm)	View Area (W×Hmm)	Character Size (W×Hmm)
DMC16106A	16 characters×1 line	5×11 dots	80×36×10	64.5×13	3.2×8.2
DMC16106C	16 characters×1 line	5×8 dots	80×36×10	64.5×13	3.2×5.95
DMC16117A	16 characters×1 line	5×8 dots	80×36×10	64.5×13	3.2×5.95
DMC16128	16 characters×1 line	5×7 dots+Cursor	122×33×11	99×13	4.84×9.66
DMC16129	16 characters×1 line	5×7 dots+Cursor	122×33×11	99×13	4.84×9.66
DMC16207	16 characters×2 lines	5×8 dots	84×44×11	61×16	2.95×5.55
DMC16230	16 characters×2 lines	5×7 dots+Cursor	122×44×11	99×24	4.84×9.66
DMC16249	16 characters×2 lines	5×8 dots	80×36×11	64.5×13.8	2.95×4.35
DMC16433	16 characters×4 lines	5×8 dots	87×60×11	61.8×25.2	2.95×4.75
DMC20171	20 characters×1 line	5×7 dots+Cursor	182×33.5×13	83×18.6	3.2×5.55
DMC20215	20 characters×2 lines	5×8 dots	116×44×11	83×18.6	3.2×5.55
DMC20261	20 characters×2 line	5×8 dots	116×37×11	83×18.6	3.2×5.55
DMC20434	20 characters×4 lines	5×8 dots	98.0×60×11	76×25.2	2.95×4.75
DMC24138	24 characters×1 line	5×11 dots	118×36×11	93.5×15.8	3.2×8.2
DMC24227	24 characters×2 lines	5×8 dots	118×36×11	93.5×15.8	3.2×5.55
DMC32132	32 characters×1 line	5×11 dots	174.5×31×11	123.5×16.5	3.2×8.2
DMC32239	32 characters×2 lines	5×8 dots	174.5×31×11	141.0×16.5	3.45×5.55
DMC32216	32 characters×2 lines	5×8 dots	175×44×11	130×18.6	3.2×5.55
DMC40131	40 characters×1 line	5×11 dots	182×33.5×11	152.5×16.5	3.2×8.2
DMC40218	40 characters×2 lines	5×8 dots	182×33.5×11	152.5×16.5	3.2×5.55
DMC40457	40 characters×4 lines	5×8 dots	190×54×10	147×29.5	2.78×4.89
DMC16187-YGR	16 characters×1 line	5×8 dots	80×36×15	64.5×13	3.2×5.95
DMC16266-YGR	16 characters×2 line	5×8 dots	84×45×15.1	61×16	2.95×5.55
DMC40267-YGR	40 characters×2 line	5×8 dots	182×34.5×15.1	161.6×16.5	3.2×5.55

Note : Please refer to page 34-35 about EL back light, Inverter and Extended Temperature Model "H".

## DMF Series

(Item) (Type No.)	Dot Pixels H×W	Dot Size W×H(mm)	Dot Pitch W×H(mm)	Module Dimensions W×H×D(mm)	Active Viewing Area W×H(mm)
DMF633	64×240	0.48×0.48	0.53×0.53	180×75×15	132×39
DMF612	64×480	0.41×0.41	0.47×0.47	260.0×58.0×12.0	229.5×36.0
DMF608	128×160	0.55×0.55	0.6×0.6	129.0×102.0×11.2	101.0×82.0
DMF605	128×480	0.41×0.41	0.47×0.47	259.0×90.0×12.6	229.5×66.0
DMF613	200×640	0.31×0.45	0.35×0.49	275.0×126.0×10.8	232.0×106.0
DMF631N	200×640	0.32×0.46	0.35×0.49	275×140×18.5	224×98



Dot Size (W×Hmm)	Recommended Power Supply		Driving Method (Duty)	Power Consumption typ. (mW)	Weight (g)	Operating Temp.(°C)	Storage Temp.(°C)
	Vcc~Vss(V)	Vee~Vss(V)					
0.6×0.7	+5	—	1/11D-1/4B	10	30	0~+50	-20~+70
0.6×0.7	+5	—	1/8D-1/4B	10	30	0~+50	-20~+70
0.6×0.7	+5	—	1/6D-1/5B	10	30	0~+50	-20~+70
0.92×1.1	+5	—	1/6D-1/5B	10	35	0~+50	-20~+70
0.92×1.1	+5	—	1/8D-1/4B	10	40	0~+50	-20~+70
0.55×0.65	+5	—	1/6D-1/5B	10	45	0~+50	-20~+70
0.92×1.1	+5	—	1/6D-1/5B	10	60	0~+50	-20~+70
0.55×0.5	+5	—	1/6D-1/5B	10	40	0~+50	-20~+70
0.55×0.55	+5	—	1/6D-1/5B	20	60	0~+50	-20~+70
0.6×0.65	+5	—	1/8D-1/4B	10	30	0~+50	-20~+70
0.6×0.65	+5	—	1/6D-1/5B	15	45	0~+50	-20~+70
0.6×0.65	+5	—	1/6D-1/5B	10	30	0~+50	-20~+70
0.55×0.55	+5	—	1/6D-1/5B	25	65	0~+50	-20~+70
0.6×0.7	+5	—	1/11D-1/4B	15	55	0~+50	-20~+70
0.6×0.65	+5	—	1/6D-1/5B	15	55	0~+50	-20~+70
0.6×0.7	+5	—	1/11D-1/4B	20	60	0~+50	-20~+70
0.65×0.65	+5	—	1/6D-1/5B	20	60	0~+50	-20~+70
0.6×0.65	+5	—	1/6D-1/5B	20	75	0~+50	-20~+70
0.6×0.7	+5	—	1/11D-1/4B	25	65	0~+50	-20~+70
0.6×0.65	+5	—	1/6D-1/5B	25	75	0~+50	-20~+70
0.5×0.55	+5	—	1/6D-1/5B	50	100	0~+50	-20~+70
0.6×0.7	+5	—	1/6D-1/5B	10	30	0~+50	-20~+70
0.55×0.65	+5	—	1/6D-1/5B	10	30	0~+50	-20~+70
0.6×0.65	+5	—	1/6D-1/5B	25	80	0~+50	-20~+70

Driving Method	Weight (g)	Operating Temp (°C)	Storage Temp (°C)	Matching Controller LSI
1/32D-1/6B	160	0~+50	-20~+60	HD61830B
1/64D-1/9B	180	0~+50	-20~+60	HD61830B
1/64D-1/9B	170	0~+50	-20~+60	HD61830 MSM6255
1/64D-1/9B	300	0~+50	-20~-60	MSM6255
1/100D-1/11B	379	0~+50	-20~+60	MSM6255 MSM6265
1/100D-1/11B	570	0~+40	-20~+60	MSM6265



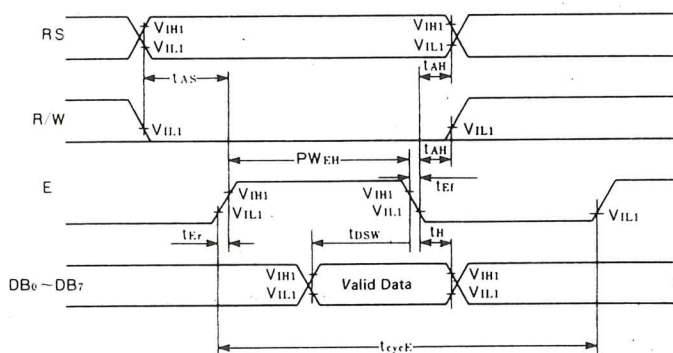


## TIMING CHART

Item	Symbol	Measuring Condition	Standard Value			Unit
			min.	typ.	max.	
Enable Cycle Time	$T_{CYCE}$	Figs. 1, 2	1000	—	—	nS
Enable Pulse Width, High Level	$P_{WEH}$	Figs. 1, 2	450	—	—	nS
Enable Rise and Decay Time	$t_{Er}, t_{Ei}$	Figs. 1, 2	—	—	25	nS
Address Setup Time, RS, R/W—E	$t_{AS}$	Figs. 1, 2	140	—	—	nS
Data Delay Time	$t_{DDR}$	Fig. 2	—	—	320	nS
Data Setup Time	$t_{DSW}$	Fig. 1	195	—	—	nS
Data Hold Time	$t_H$	Fig. 1	10	—	—	nS
Data Hold Time	$t_{DHR}$	Fig. 2	20	—	—	nS
Address Hold Time	$t_{AH}$	Figs. 1, 2	10	—	—	nS

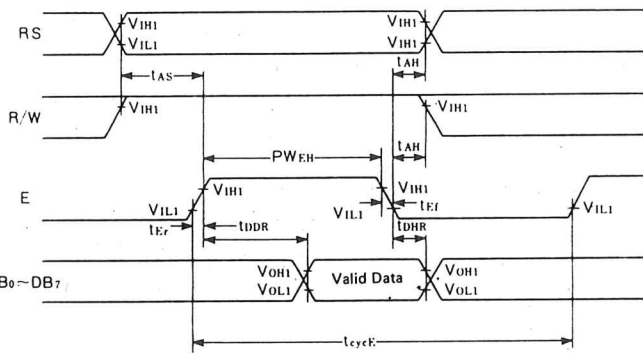
※  $V_{CC} = 5.0V \pm 5\%$ ,  $T_a = 25^\circ C$

FIG. 1 WRITE OPERATION



(Write Data from MPU to MODULE)

FIG. 2 READ OPERATION



(Reading Data from MODULE to MPU)

## PIN ASSIGNMENT

Pin No.	Symbol	Level	Function
1	$V_{SS}$	—	Power Supply
2	$V_{CC}$	—	
3	$V_{EE}$	—	
4	RS	H/L	Register H: Data Input Select L: Instruction Input
5	R/W	H/L	H: Data Read (Module→MPU) L: Data Write (Module←MPU)
6	E	H, H←L	Enable Signal
7	DB0	H/L	Data Bus Line
8	DB1	H/L	
9	DB2	H/L	
10	DB3	H/L	
11	DB4	H/L	
12	DB5	H/L	
13	DB6	H/L	
14	DB7	H/L	

■ In the data bus line, data transfer is performed two times by the 4-bit or one time by the 8-bit in order to interface with 4-bit or 8-bit MPU.

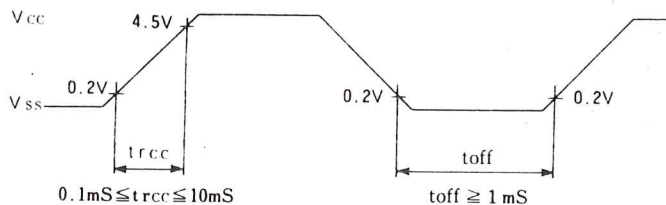
■ In case interface data length is 4-bit. The data is transferred by using only four buses of DB4~DB7 and the buses of DB0~DB3 are not used. The data transfer to MPU is completed by transferring the data of 4-bits twice. Transfer of upper four bits and low four bits is performed in sequence.

■ In case interface data length is 8-bit. Data transfer is performed by using eight buses of DB0~DB7.

## POWER SUPPLY RESET

The internal reset circuit will not be correctly operated, when the following power supply condition is not satisfied. In this case, please perform initial setting according to the instruction.

Item	Symbol	Measuring Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Rise Time	$t_{rcc}$	—	0.1	—	10	mS
Power Supply Off Time	$t_{off}$	—	1	—	—	mS



Note: The item  $t_{off}$  defines the time when the power supply is off, when the power supply shuts down momentarily or repeats on-off state.

### RESET FUNCTION

#### ● Initializing by Internal Reset Circuit

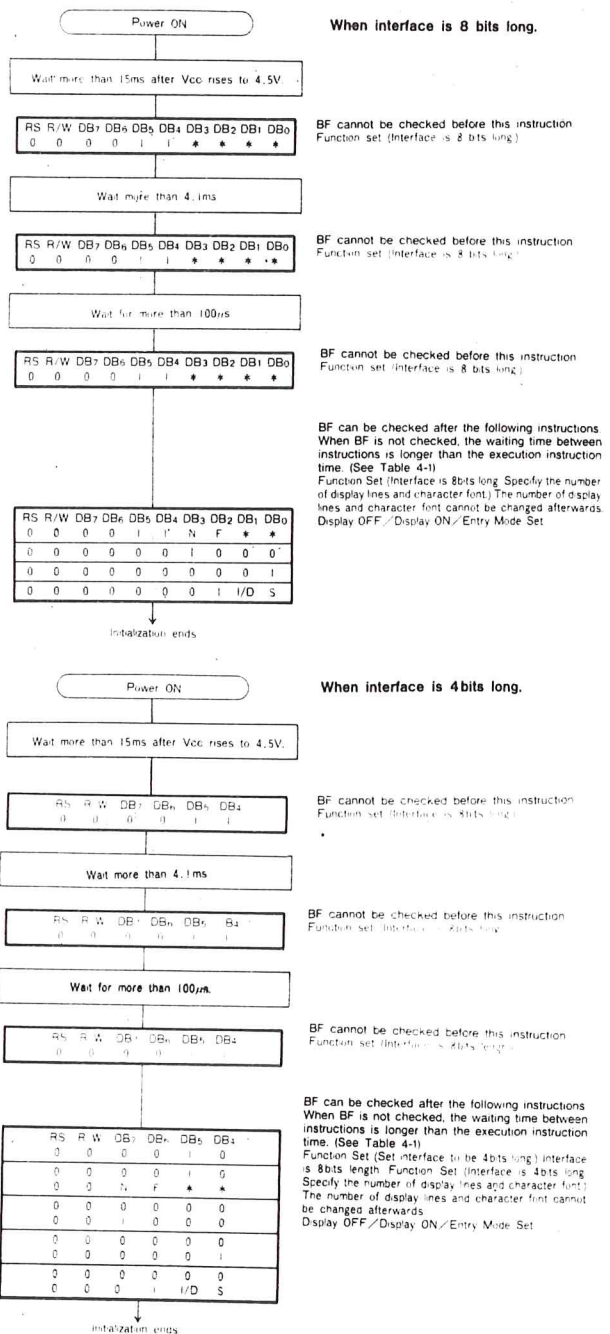
The HD44780 automatically initializes (resets) when power is turned on using the internal reset circuit. The following instructions are executed in initialization. The busy flag (BF) is kept in busy state until initialization ends. (BF=1) The busy state is 10ms after  $V_{cc}$  rises to 4.5V.

- (1) Display clear
- (2) Function set  
DL=1 : 8bit long interface data  
N=0 : 1-line display F=0 : 5×7dot character font
- (3) Display ON/OFF control  
D=0 : Display OFF C=0 : Cursor OFF B=0 : Blink OFF
- (4) Entry mode set  
I/D=1 : +1(increment) S=0 : No shift

Note: When conditions in "Power Supply Conditions Using Internal Reset Circuit" are not met, the internal reset circuit will not operate normally and initialization will not be performed. In this case initialize by MPU according to "Initializing by Instruction".

#### ● Initializing by Instruction

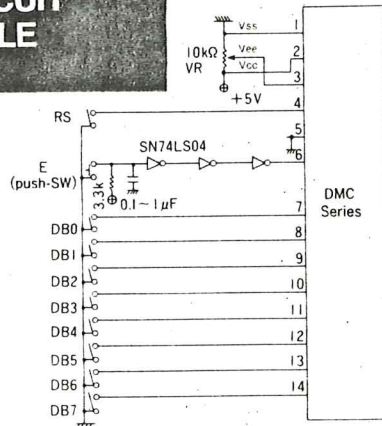
If the power supply conditions for correctly operating the internal reset circuit are not met, initialization by instruction is required. Use the following procedure for initialization.





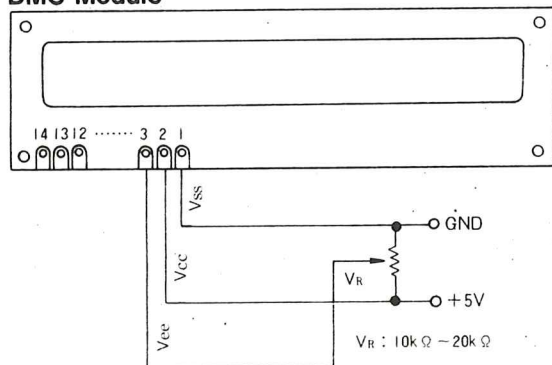
## TEST CIRCUIT OF MODULE

SW ON "L" level.  
SW OFF "H" level.

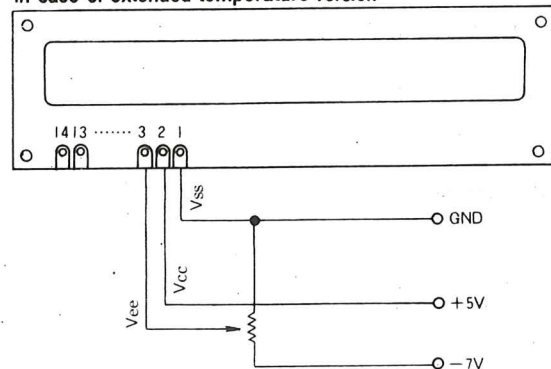


## EXAMPLE OF POWER SUPPLY

### DMC Module



### In case of extended temperature version



※NOTE:When the voltage of Vee is different from the recommended voltage, the viewing angle may be changed.

## Examples of Temperature Compensation Circuits for Extended Temp Type.(Only for reference)

### (A) 1/8Duty-1/4Bias

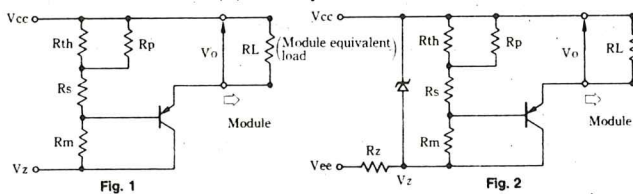
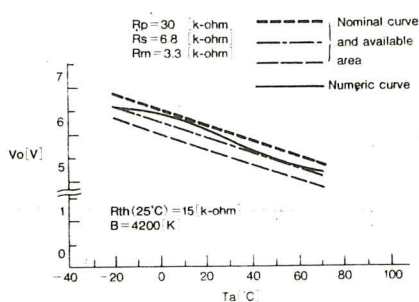


Fig. 1

Fig. 2

Thermistor:  $R_{th}(25^{\circ}\text{C}) = 15[\text{k}\Omega]$ ,  $B = 4200[\text{K}]$   
Resistors:  $R_p = 30[\text{k}\Omega]$ ,  $R_s = 6.8[\text{k}\Omega]$ ,  $R_m = 3.3[\text{k}\Omega]$   
Transistor: PNP Type  
 $V_{cc} = +5\text{V}$ ,  $V_{ss} = 0\text{V}$  (Logic Supply)  
 $V_z = -8[\text{V}]$  (-7.8 to -8.2[V])  
 $V_{ee} < V_z[\text{V}]$ ,  $R_z = (V_z - V_{ee})/5[\text{k}\Omega]$



※Specifications are subject to change without notice

### (B) 1/16Duty-1/5Bias

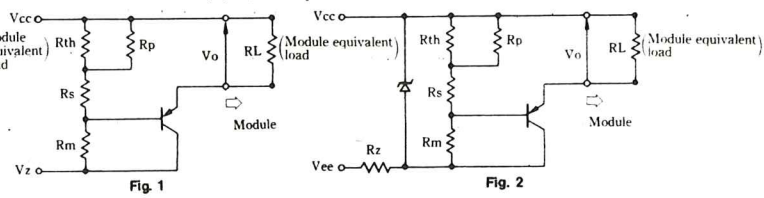
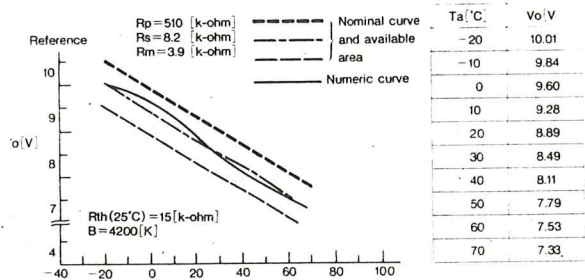


Fig. 1

Fig. 2

Thermistor:  $R_{th}(25^{\circ}\text{C}) = 15[\text{k}\Omega]$ ,  $B = 4200[\text{K}]$   
Resistors:  $R_p = 510[\text{k}\Omega]$ ,  $R_s = 8.2[\text{k}\Omega]$ ,  $R_m = 3.9[\text{k}\Omega]$   
Transistor: PNP Type  
 $V_{cc} = +5\text{V}$ ,  $V_{ss} = 0\text{V}$  (Logic Supply)  
 $V_z = -11[\text{V}]$  (-10.725 to -11.275[V])  
 $V_{ee} < V_z[\text{V}]$ ,  $R_z = (V_z - V_{ee})/5[\text{k}\Omega]$



## INSTRUCTIONS

Instruction	Code										Description	Execute Time(max.) (NOTE 1)
	RS	R/W	DB 7	DB 6	DB 5	DB 4	DB 3	DB 2	DB 1	DB 0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears all display and returns the cursor to the home position (Address 0).	1.64mS
Cursor At Home	0	0	0	0	0	0	0	0	0	*	Returns the cursor to the home position (Address 0). Also returns the display being shifted to the original position. DDRAM contents remain unchanged.	1.64mS
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor move direction and specifies or not to shift the display. These operations are performed during data write and read.	40μS
Display On/Off Control	0	0	0	0	0	0	1	D	C	B	Sets ON/OFF of all display (D) cursor ON /OFF (C), and blink of cursor position character (B).	40μS
Cursor/Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing DDRAM contents.	40μS
Function Set	0	0	0	0	1	DL	N	F	*	*	Sets interface data length (DL) number of display lines (L) and character font (F).	40μS
CGRAM Address Set	0	0	0	1	ACG						Sets the CGRAM address. CGRAM data is sent and received after this setting.	40μS
DDRAM Address Set	0	0	1	ADD						Sets the DDRAM address. DDRAM data is sent and received after this setting	40μS	
Busy Flag/ Address Read	0	1	BF		AC					Reads Busy flag (BF) indicating internal operation is being performed and reads address counter contents.	0μS	
CGRAM/DDRAM Data Write	1	0	WRITE DATA								Writes data into DDRAM or CGRAM.	40μS
CGRAM/DDRAM Data Read	1	1	READ DATA								Reads data from DDRAM or CGRAM.	40μS

Code	Description	Execute Time (max.)
I/D = 1 : Increment I/D = 0 : Decrement S = 1 : With display shift S/C = 1 : Display shift S/C = 0 : Cursor movement R/L = 1 : Shift to the right R/L = 0 : Shift to the left DL = 1 : 8-bit DL = 0 : 4-bit N = 1 : 1/16Duty N = 0 : 1/8Duty, 1/11Duty F = 1 : 5×10dots F = 0 : 5×7dots BF = 1 : Internal operation is being performed BF = 0 : Instruction acceptable	DDRAM : Display Data RAM CGRAM : Character Generator RAM ACG : CGRAM Address ADD : DDRAM Address Corresponds to cursor address. AC : Address Counter, used for both DDRAM and CGRAM * : Invalid	fcp or fosc = 250kHz  However, when frequency changes, execution time also changes  Ex  When fcp or fosc = 270kHz, $40\mu S \times \frac{250}{270} = 37\mu S$



# FONT TABLE

(5×11Dots)

(5×8Dots)

Lower 4-bit \ Upper 4-bit	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111	1110	1111
××××0000	CG RAM (1)														
××××0001	(2)														
××××0010	(3)														
××××0011	(4)														
××××0100	(5)														
××××0101	(6)														
××××0110	(7)														
××××0111	(8)														
××××1000	(1)														
××××1001	(2)														
××××1010	(3)														
××××1011	(4)														
××××1100	(5)														
××××1101	(6)														
××××1110	(7)														
××××1111	(8)														

\*CG RAM : Character pattern area can be rewritten by program.

## DMC16106A

• Display Format(16character × 1line) • Display Fonts(5×11dots) • Driving Method( $\frac{1}{11}$ D)

### ABSOLUTE MAXIMUM RATINGS

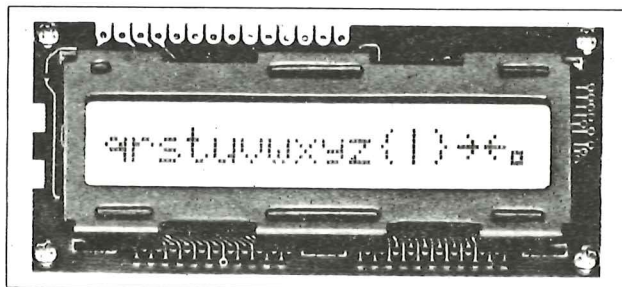
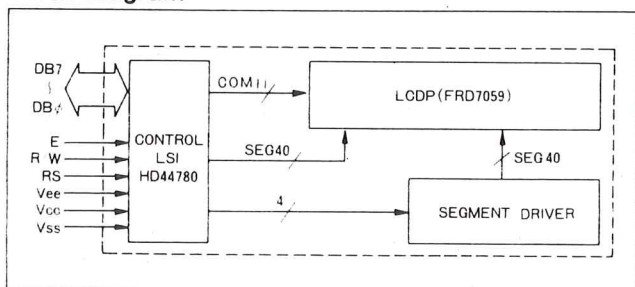
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_i$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

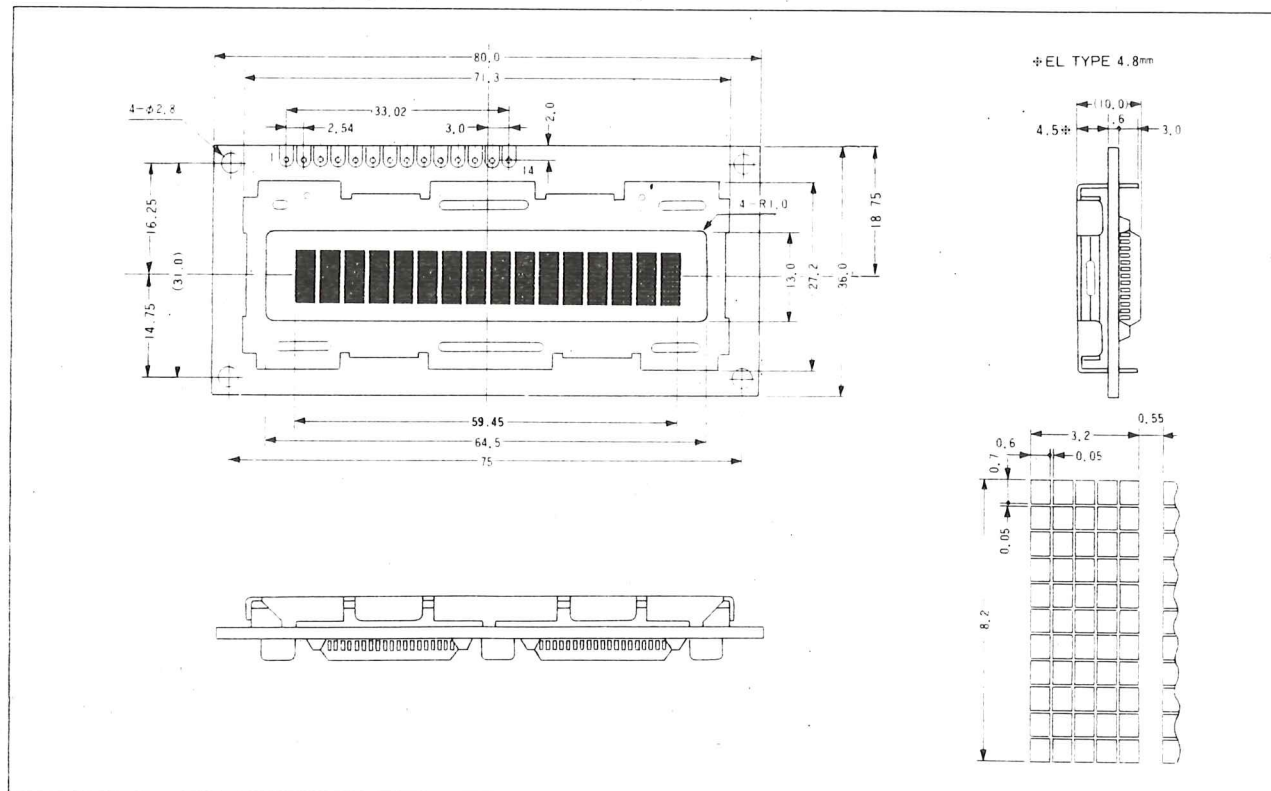
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205mA$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2mA$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0V$	—	0.5	2.0	mA

※  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^\circ C$

### Block diagram



### External dimensions / Display pattern





# DMC16106C

• Display Format(16character × 1line) • Display Fonts(5×8dots) • Driving Method( $\frac{1}{8}$ D)

## ABSOLUTE MAXIMUM RATINGS

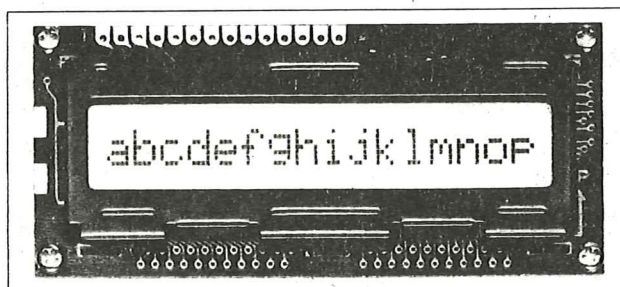
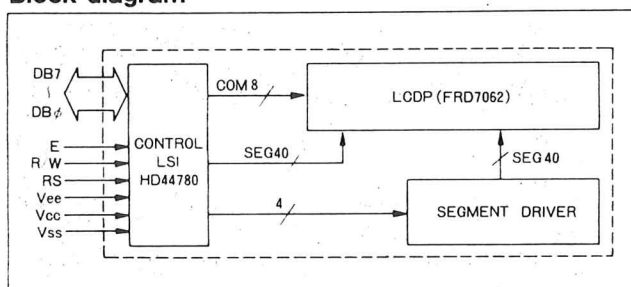
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim$ $V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim$ $V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

## ELECTRICAL CHARACTERISTICS

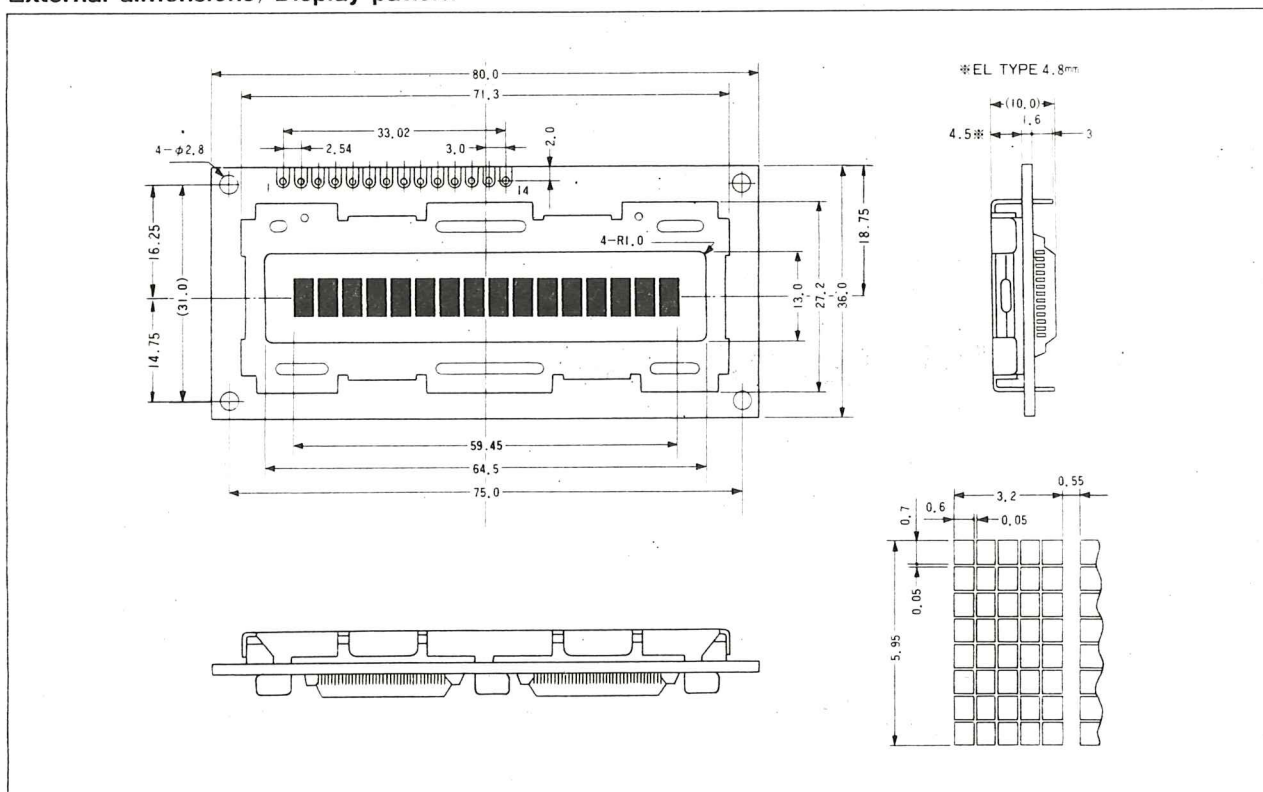
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$I_{OH}=0.205mA$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2mA$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0V$	—	0.5	2.0	mA

※  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^\circ C$

## Block diagram



## External dimensions / Display pattern



## DMC16117A

• Display Format(16character × 1line) • Display Fonts(5×8dots) • Driving Method( $\frac{1}{16}$ D)

### ABSOLUTE MAXIMUM RATINGS

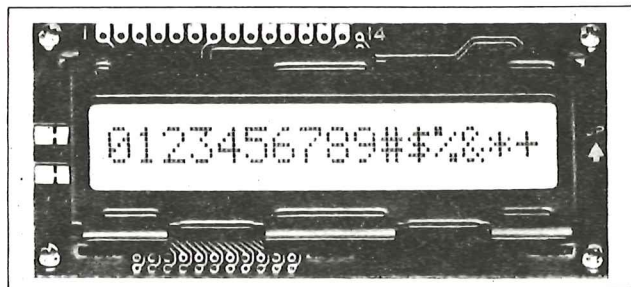
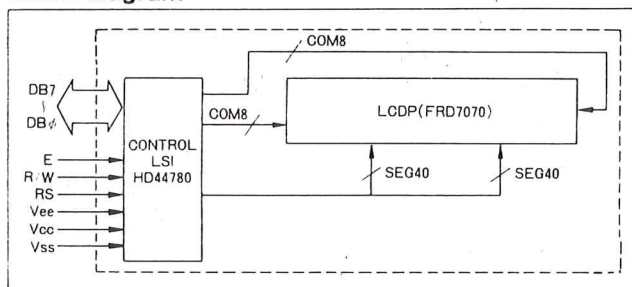
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

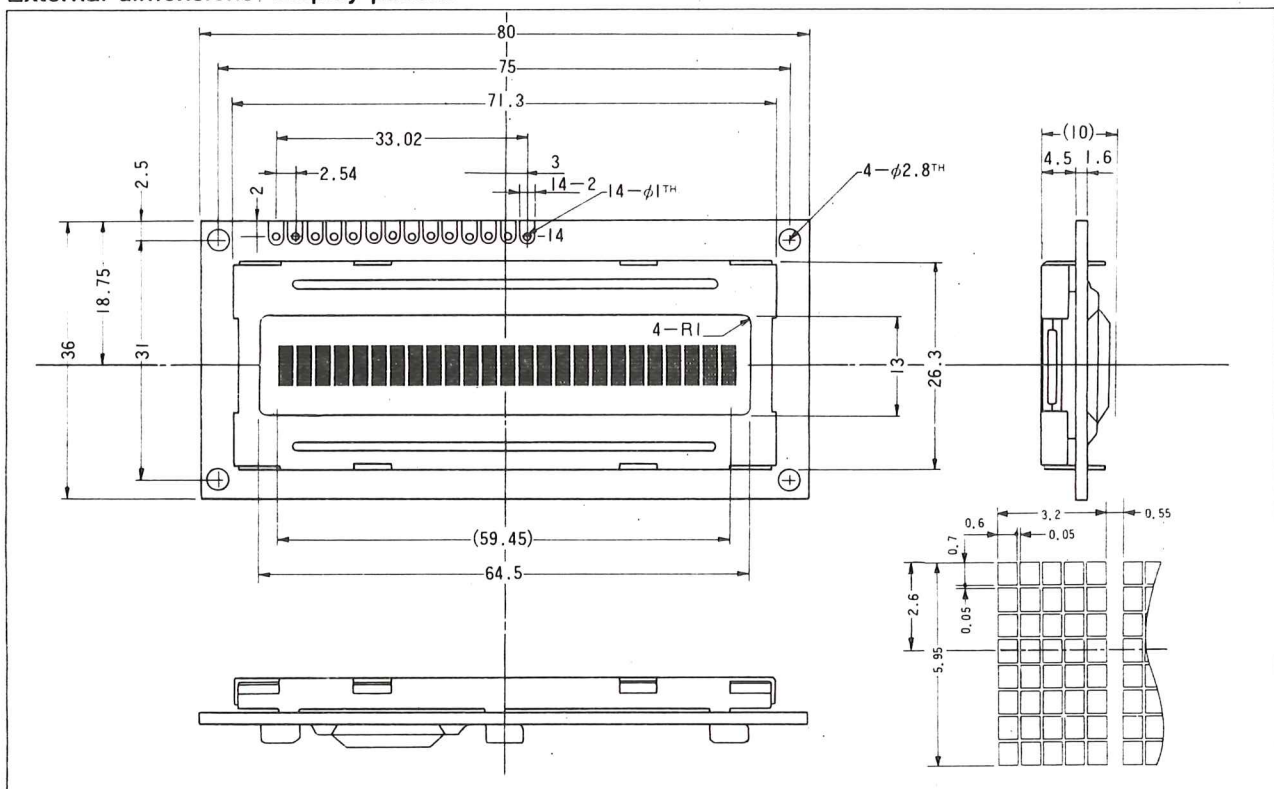
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	0.5	2.0	mA

※  $V_{CC}=5.0\text{V} \pm 5\%$ ,  $T_a=25^\circ\text{C}$

### Block diagram



### External dimensions / Display pattern





## DMC16128

• Display Format(16character × 1line) • Display Fonts(5×7dots+cursor) • Driving(1/6D)

### ABSOLUTE MAXIMUM RATINGS

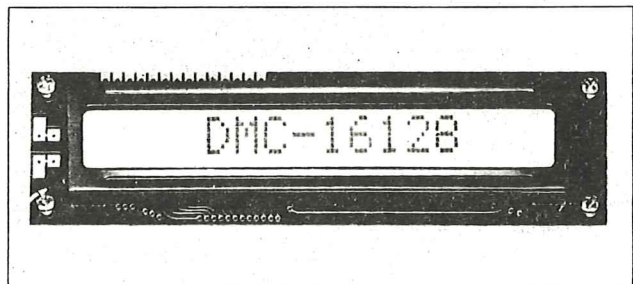
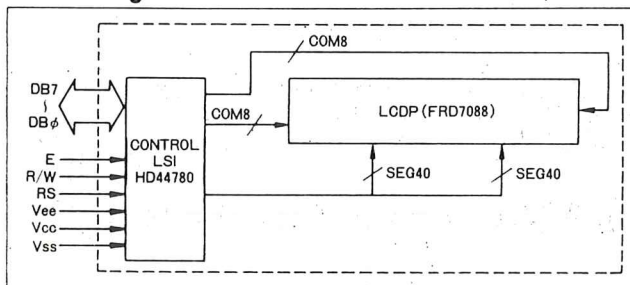
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	V <sub>CC</sub> ~ V <sub>SS</sub>	—	0	—	7	V
Power Supply Voltage for LCD Drive	V <sub>CC</sub> ~ V <sub>EE</sub>	—	0	—	13.5	V
Input Voltage	V <sub>I</sub>	—	V <sub>SS</sub>	—	V <sub>CC</sub>	V
Operating Temperature	T <sub>a</sub>	—	0	—	+50	°C
Storage Temperature	T <sub>stg</sub>	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

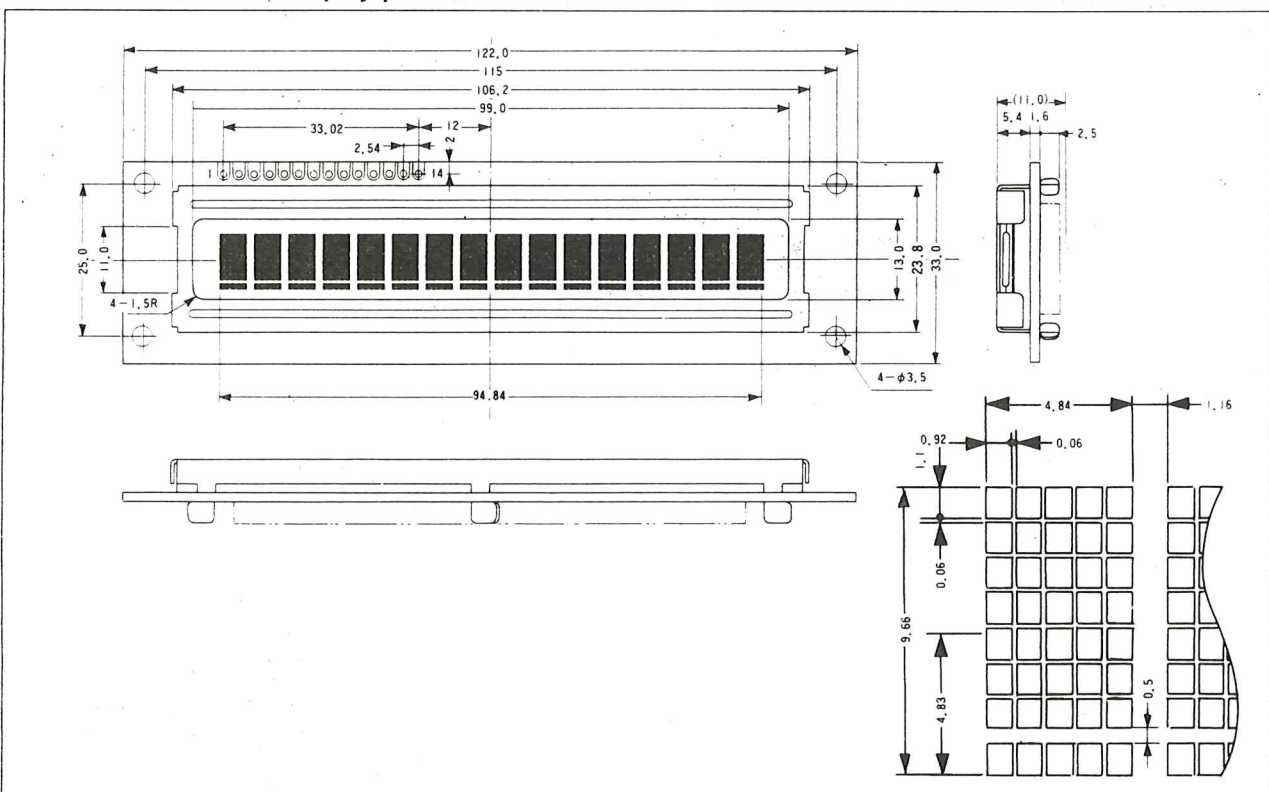
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	V <sub>IH</sub>	—	2.2	—	V <sub>CC</sub>	V
Input "Low" Voltage	V <sub>IL</sub>	—	-0.3	—	0.6	V
Output "High" Voltage	V <sub>OH</sub>	-I <sub>OH</sub> =0.205mA	2.4	—	—	V
Output "Low" Voltage	V <sub>OL</sub>	I <sub>OH</sub> =1.2mA	—	—	0.4	V
Power Supply Current	I <sub>CC</sub>	V <sub>CC</sub> =5.0V	—	0.5	2.0	mA

※ V<sub>CC</sub>=5.0V±5%, T<sub>a</sub>=25°C

### Block diagram



### External dimensions / Display pattern



## DMC16129

• Display Format(16character × 1line) • Display Fonts(5 × 7dots+cursor) • Driving Method( $\frac{1}{8}$ D)

### ABSOLUTE MAXIMUM RATINGS

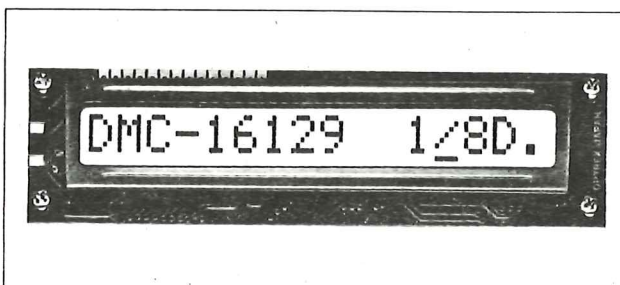
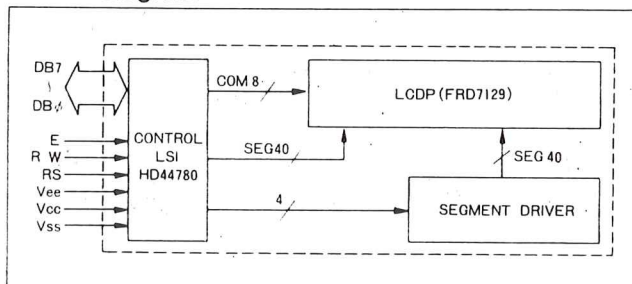
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_i$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

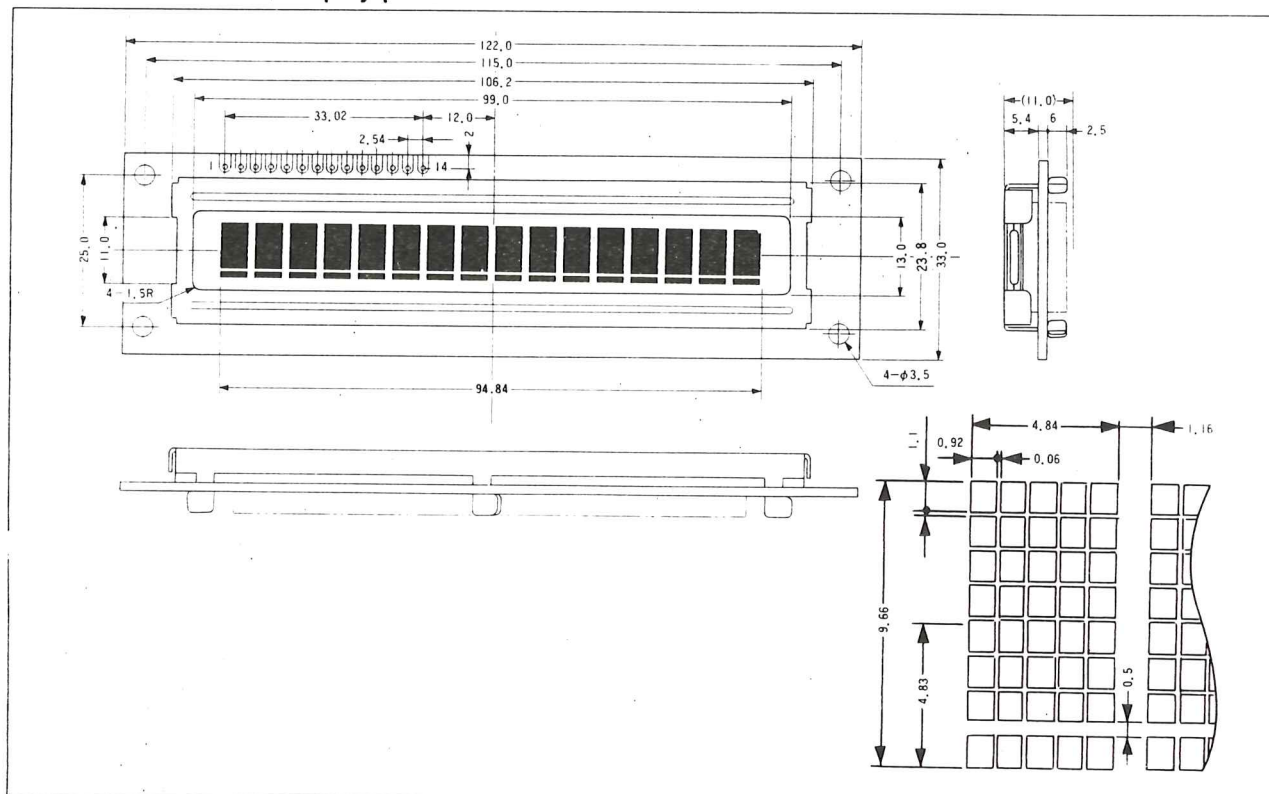
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	0.5	2.0	mA

\* $V_{CC}=5.0\text{V} \pm 5\%$ ,  $T_a=25^\circ\text{C}$

### Block diagram



### External dimensions / Display pattern





# DMC16207

• Display Format (16 character × 2 line) • Display Fonts (5 × 8 dots) • Driving Method (1/16D)

## ABSOLUTE MAXIMUM RATINGS

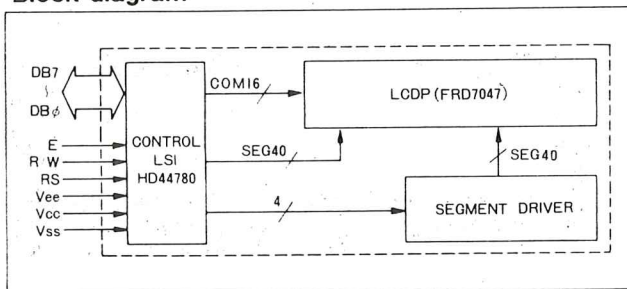
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	V <sub>CC</sub> ~ V <sub>SS</sub>	—	0	—	7	V
Power Supply Voltage for LCD Drive	V <sub>CC</sub> ~ V <sub>EE</sub>	—	0	—	13.5	V
Input Voltage	V <sub>I</sub>	—	V <sub>SS</sub>	—	V <sub>CC</sub>	V
Operating Temperature	T <sub>a</sub>	—	0	—	+50	°C
Storage Temperature	T <sub>stg</sub>	—	-20	—	+70	°C

## ELECTRICAL CHARACTERISTICS

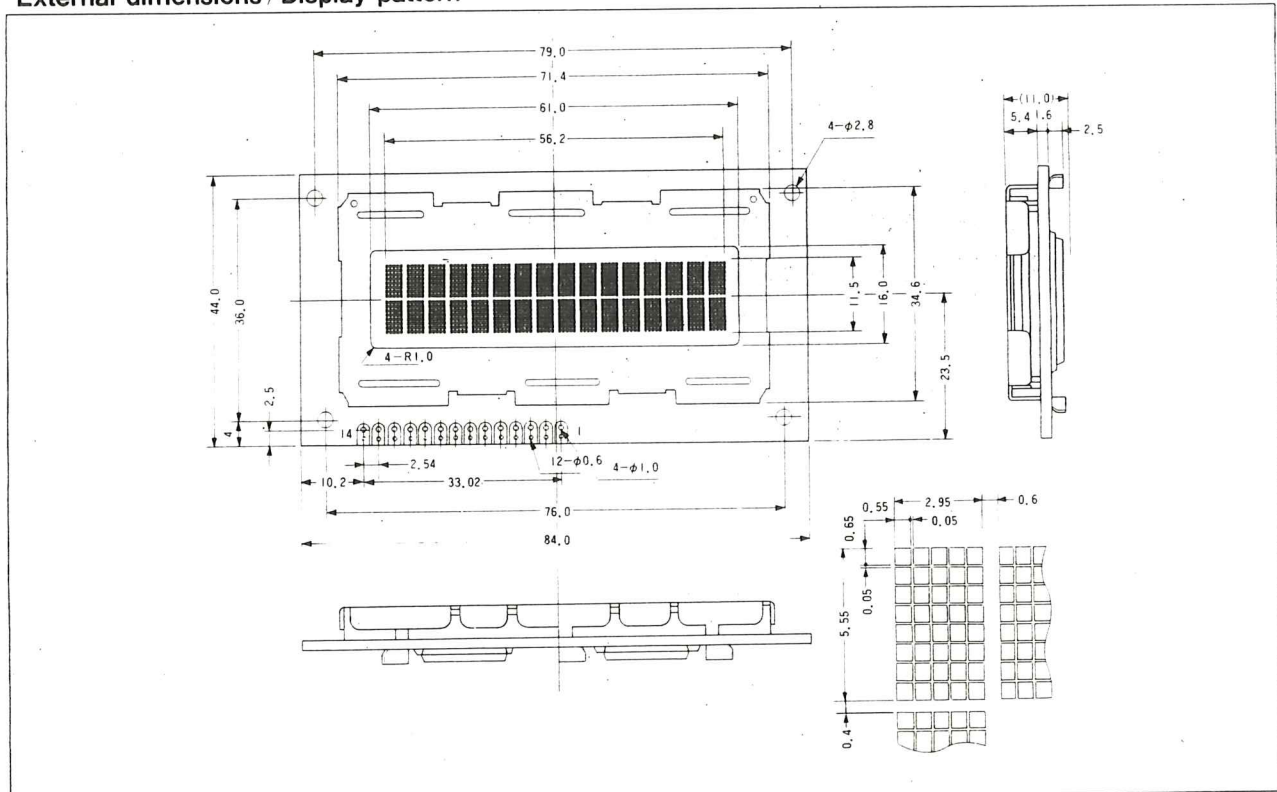
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	V <sub>IH</sub>	—	2.2	—	V <sub>CC</sub>	V
Input "Low" Voltage	V <sub>IL</sub>	—	-0.3	—	0.6	V
Output "High" Voltage	V <sub>OH</sub>	-I <sub>OH</sub> = 0.205mA	2.4	—	—	V
Output "Low" Voltage	V <sub>OL</sub>	I <sub>OH</sub> = 1.2mA	—	—	0.4	V
Power Supply Current	I <sub>CC</sub>	V <sub>CC</sub> = 5.0V	—	0.5	2.0	mA

\* V<sub>CC</sub> = 5.0V ± 5%, T<sub>a</sub> = 25°C

## Block diagram



## External dimensions / Display pattern



## DMC16230

● Display Format(16 character × 2line) ● Display Fonts (5 × 7 dots + cursor) ● Driving Method( $\frac{1}{16}$ D)

### ABSOLUTE MAXIMUM RATINGS

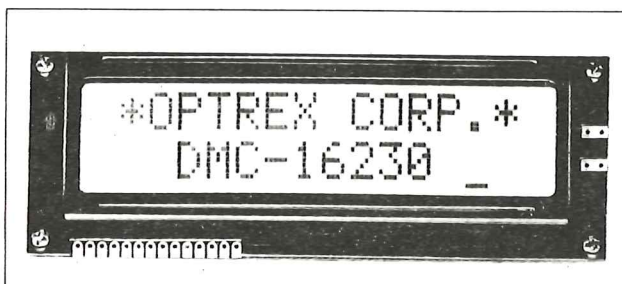
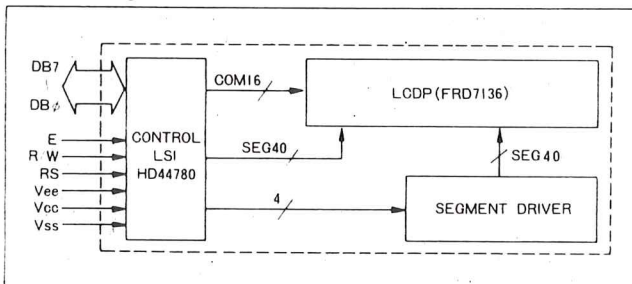
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

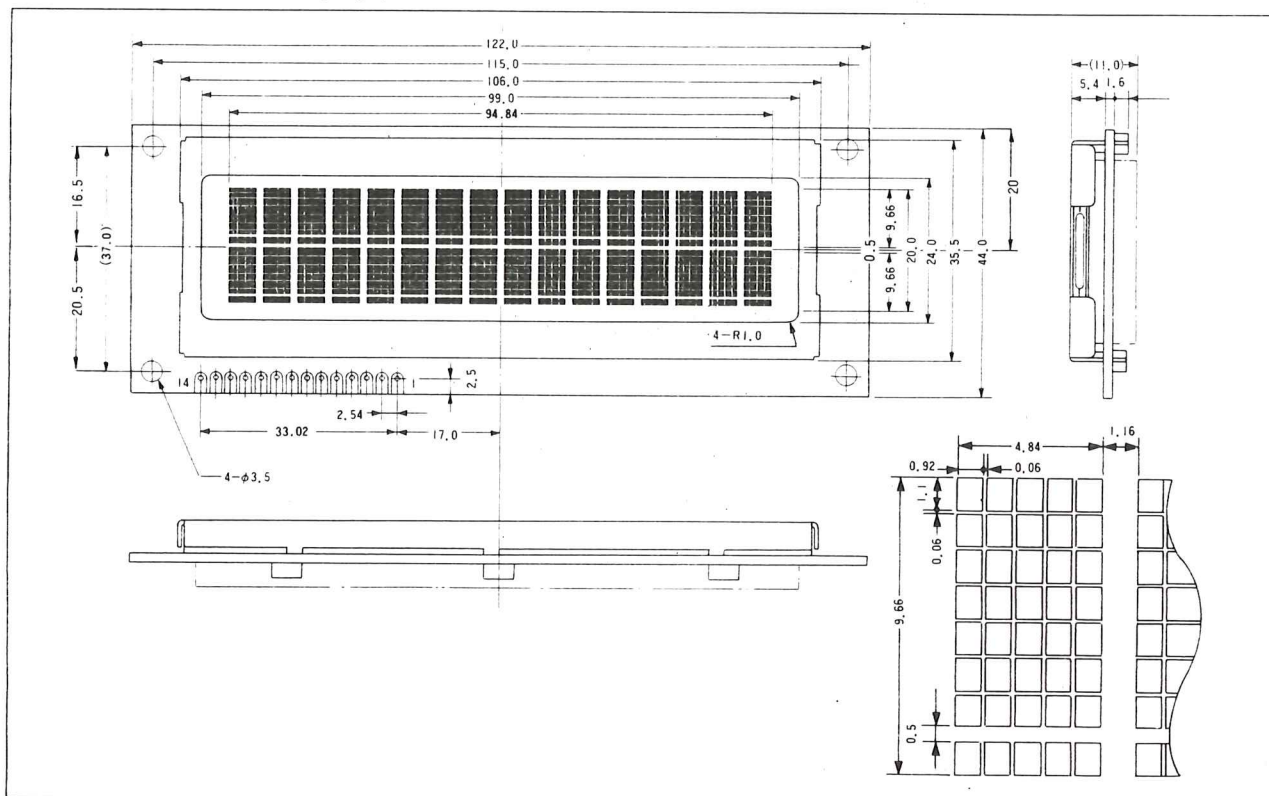
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	0.5	2.0	mA

\*  $V_{CC}=5.0\text{V} \pm 5\%$ ,  $T_a=25^\circ\text{C}$

### Block diagram



### External dimensions / Display pattern





## DMC16249

● Display Format (16 character + 2 line) ● Display Fonts (5 × 8 dots) ● Driving method (1/16D)

### ABSOLUTE MAXIMUM RATINGS

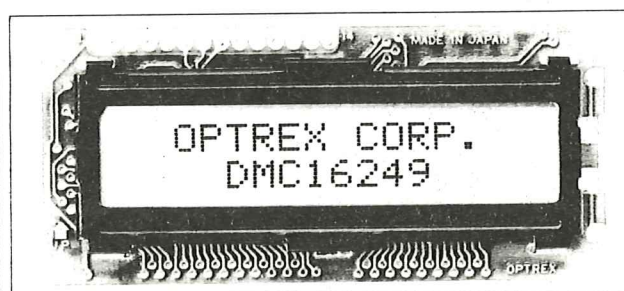
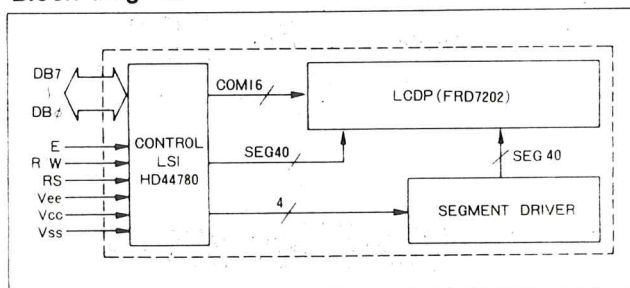
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input "High" Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

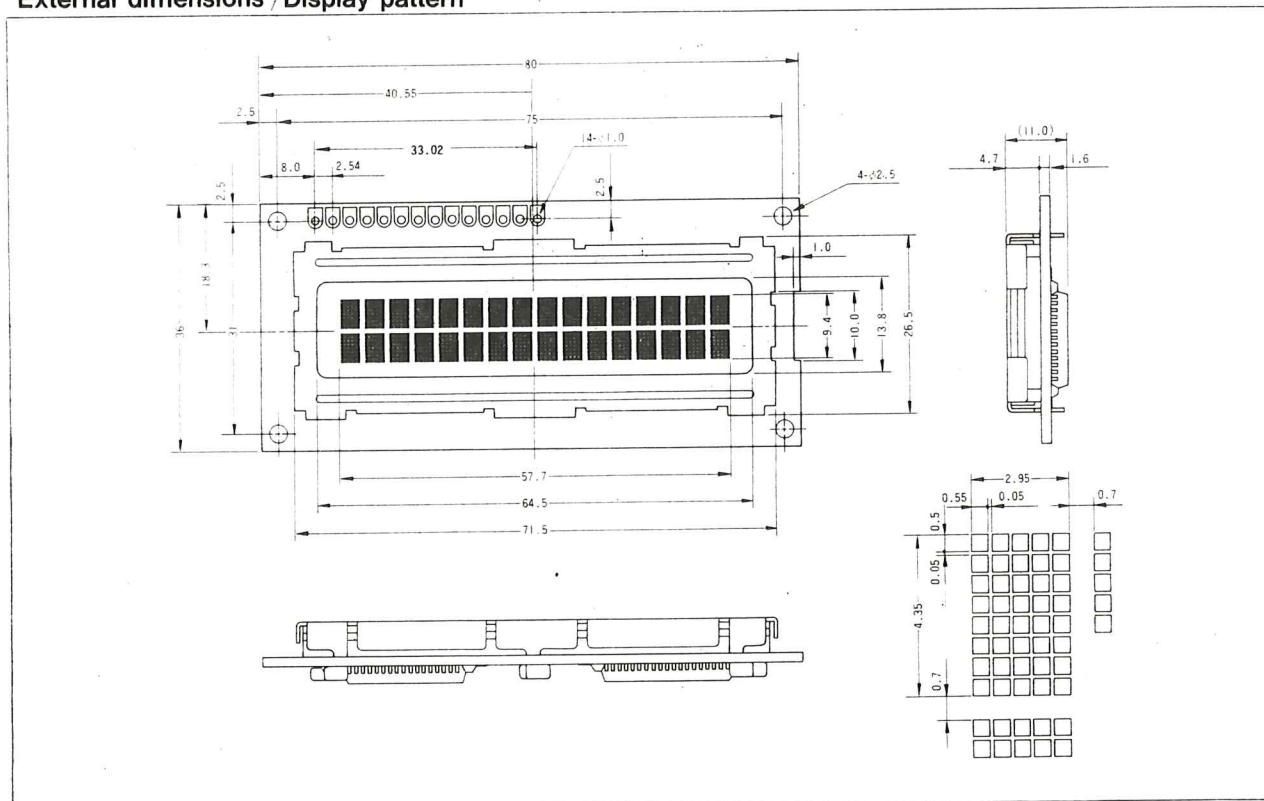
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	0.5	2.0	mA

※  $V_{CC}=5.0\text{V} \pm 5\%$ ,  $T_a=25^\circ\text{C}$

### Block diagram



### External dimensions / Display pattern



## DMC16433

• Display Format(16character ×4line) • Display Fonts(5×8dots) • Driving Method( $\frac{1}{16}$ D)

### ABSOLUTE MAXIMUM RATINGS

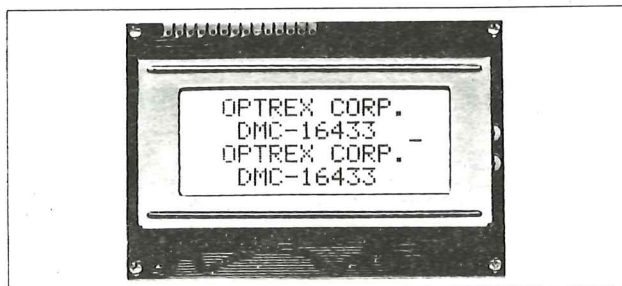
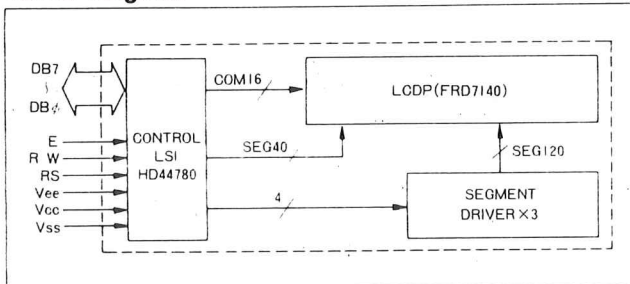
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} - V_{SS}$	—	0	—	6.5	V
Power Supply Voltage for LCD Drive	$V_{CC} - V_{EE}$	—	0	—	6.0	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

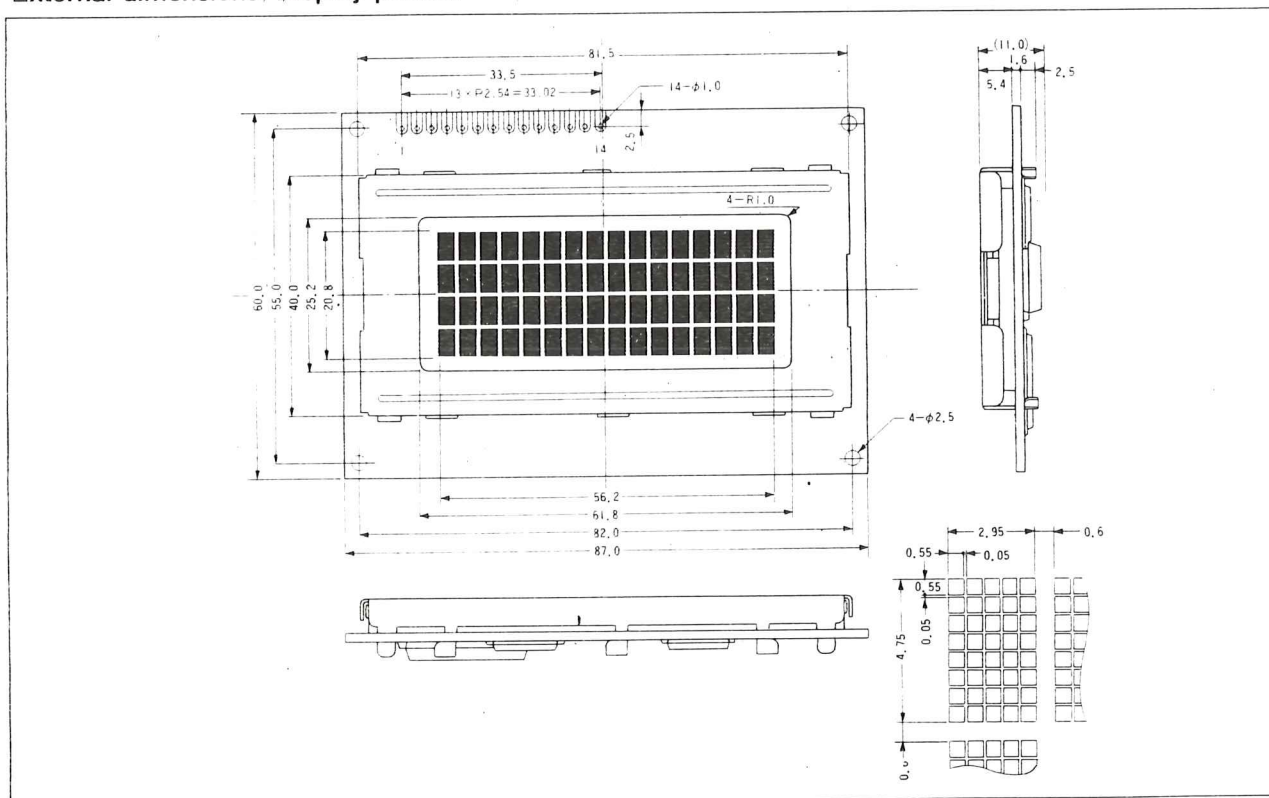
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	2.4	4.0	mA

※  $V_{CC}=5.0\text{V} \pm 5\%$ ,  $T_a=25^\circ\text{C}$

### Block diagram



### External dimensions / Display pattern











## DMC20261

• Display Format(20character ×2line) • Display Fonts(5×8dots) • Driving Method( $\frac{1}{16}$ D)

### ABSOLUTE MAXIMUM RATINGS

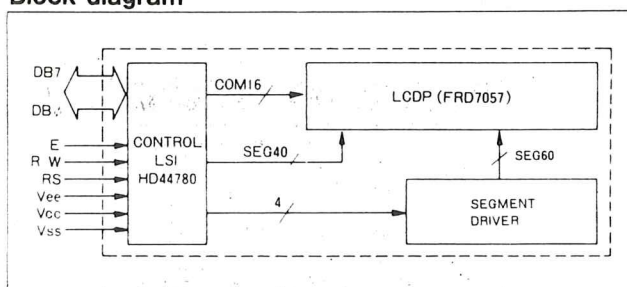
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_i$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_{opr}$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

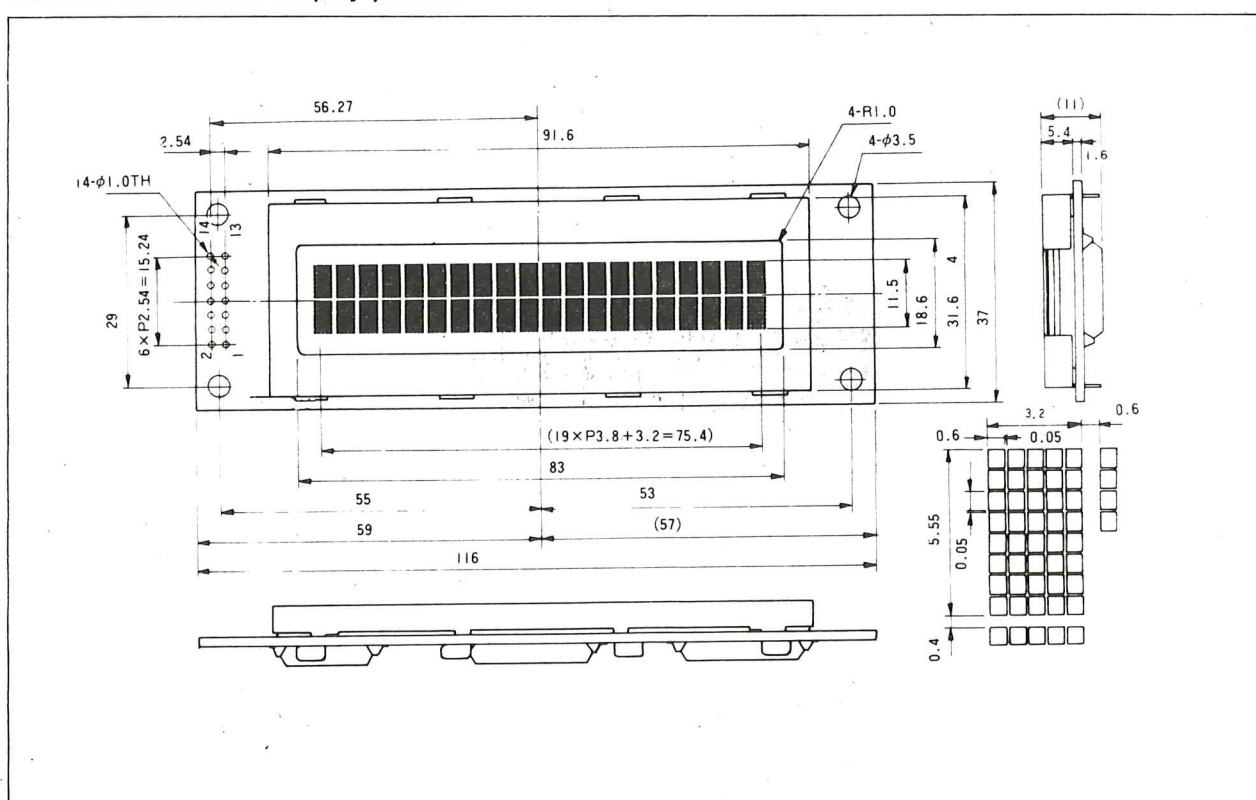
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	1.5	3.0	mA

※  $V_{CC}=5.0\text{V} \pm 5\%$ ,  $T_a=25^\circ\text{C}$

### Block diagram



### External dimensions / Display pattern



## DMC20434

● Display Format(20character ×4line) ● Display Fonts(5×8dots) ● Driving Method(1/16D)

### ABSOLUTE MAXIMUM RATINGS

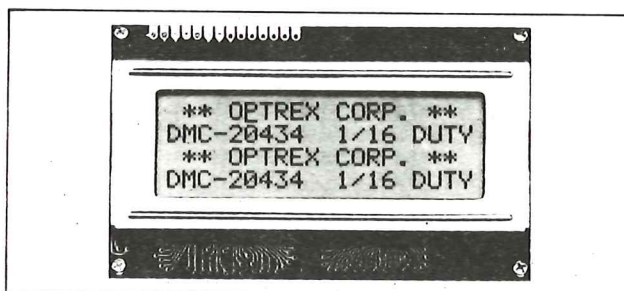
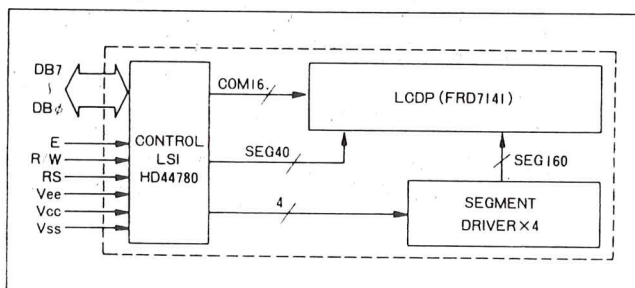
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	6.5	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	6.0	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

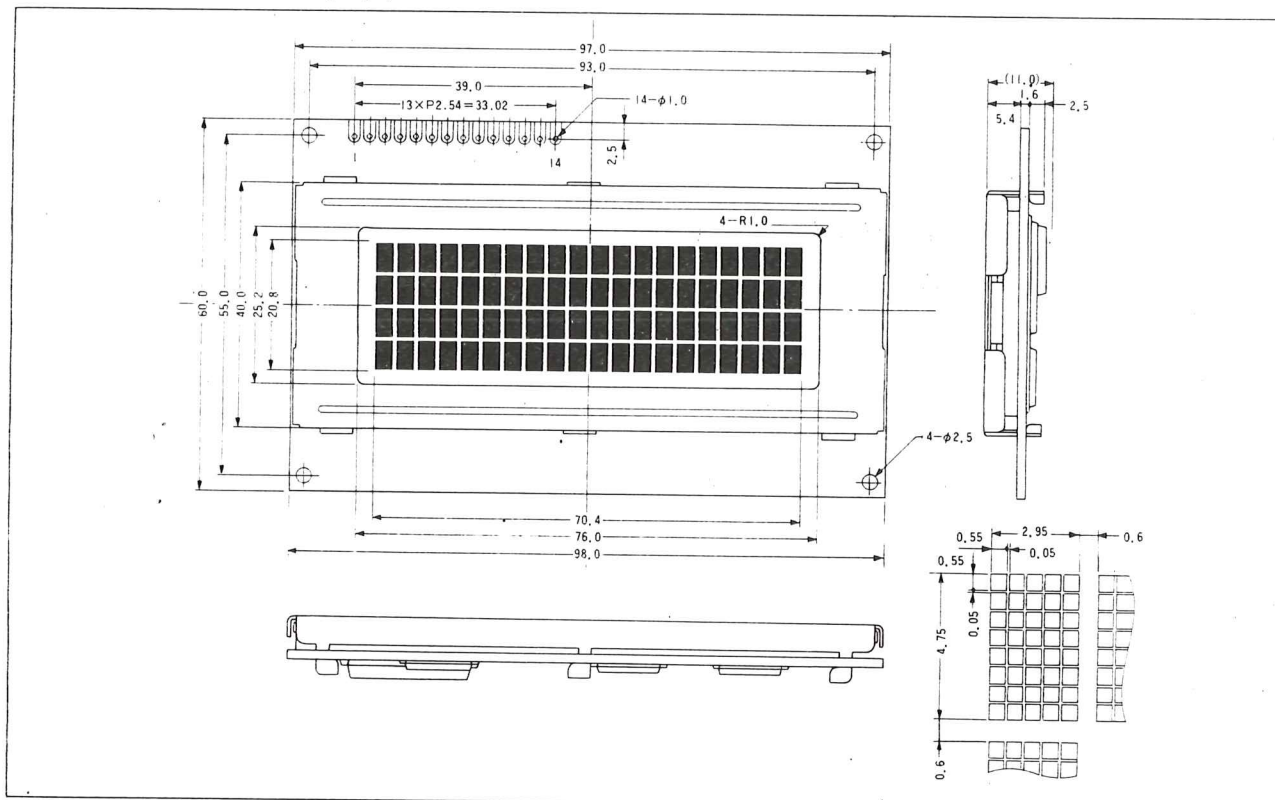
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OL}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	2.0	5.0	mA

※  $V_{CC}=5.0\text{V} \pm 5\%$ ,  $T_a=25^\circ\text{C}$

### Block diagram



### External dimensions / Display pattern



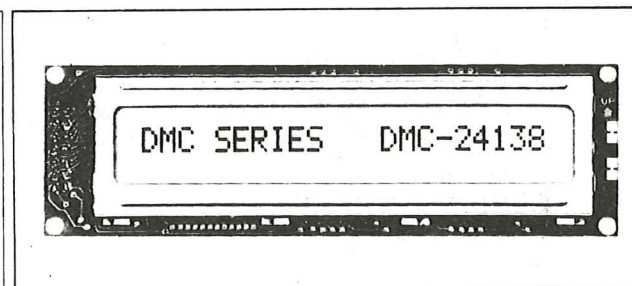


- Display Format(24character × 1line)
- Display Fonts(5×11dots)
- Driving Method( $\frac{1}{11}$ D)

## ELECTRICAL CHARACTERISTICS

Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{ mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{ mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{ V}$	—	1.5	3.0	mA

### Block diagram



Technical drawing of a rectangular metal component, likely a heat exchanger or filter housing, showing detailed dimensions and cross-sections.

**Main Dimensions (mm):**

- Overall Length: 118
- Overall Width: 36
- Internal Length: 61.75
- Internal Width: 102.5
- Distance from Left Edge to Centerline: 59.25
- Distance from Right Edge to Centerline: 53.75
- Distance from Left Edge to First Port: 2.54
- Distance from First Port to Centerline: 89.45
- Distance from Centerline to Last Port: 93.5
- Distance from Last Port to Right Edge: 102.5

**Port Details:**

- Number of Ports: 14
- Port Diameter:  $\phi 1.0$
- Port Spacing: 15.24
- Port Diameter (Right View):  $\phi 2.5$

**Internal Features:**

- Internal Fillet Radius:  $R1.5$
- Internal Fillet Radius (Right View):  $R1.5$
- Internal Fillet Radius (Bottom View):  $R1.5$

**Cross-Section Details:**

- Top View:** Shows a rectangular cross-section with a width of 5.4 mm and a height of 1.6 mm. The overall width is 11.0 mm.
- Bottom View:** Shows a rectangular cross-section with a width of 0.7 mm and a height of 0.05 mm. The overall width is 3.2 mm and the overall height is 0.55 mm.

## DMC24227

• Display Format(24character ×2line) • Display Fonts(5×8dots) • Driving Method( $\frac{1}{16}$ D)

### ABSOLUTE MAXIMUM RATINGS

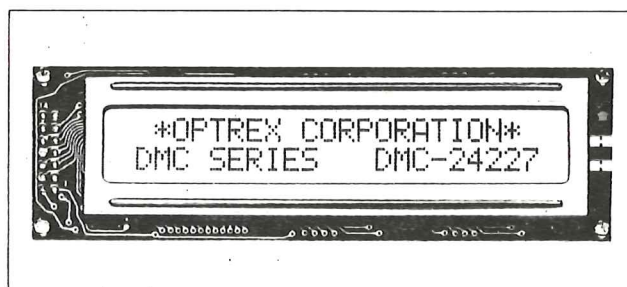
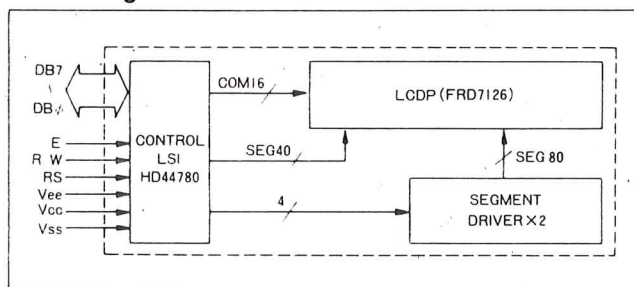
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

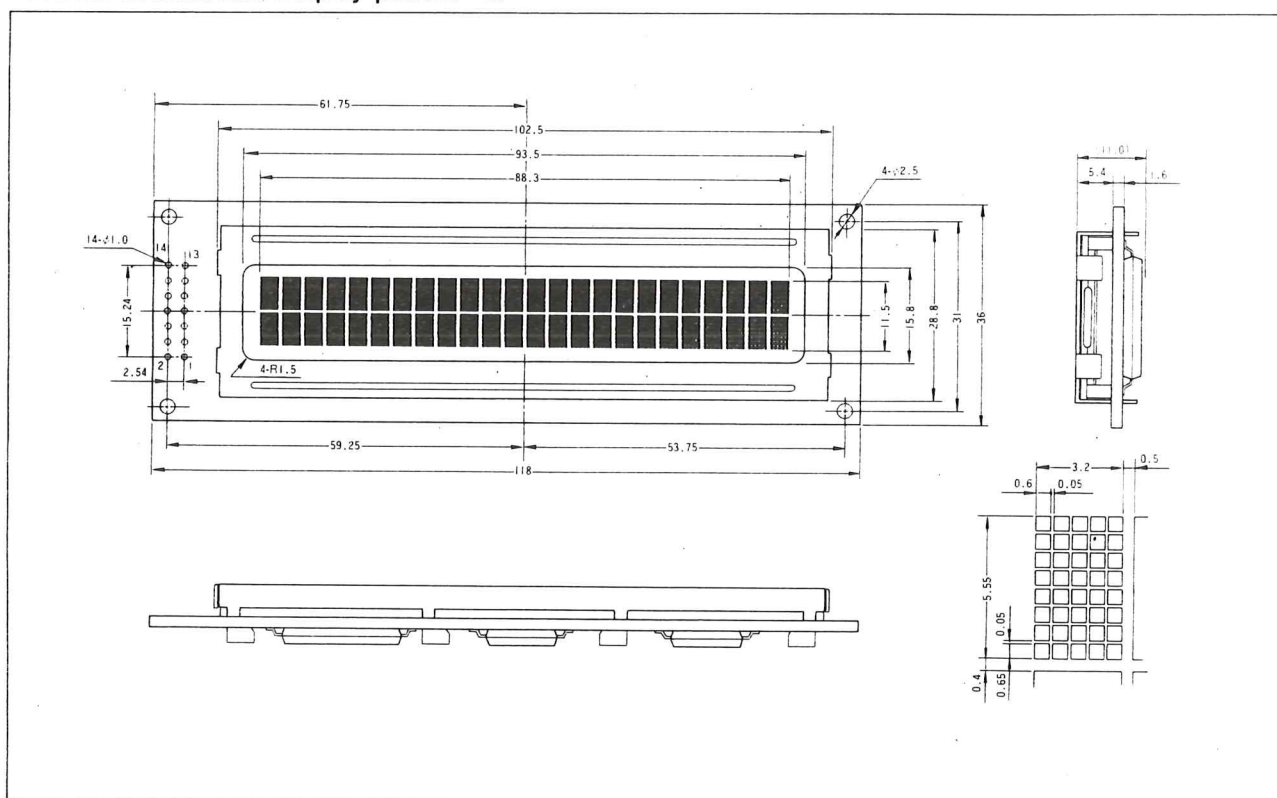
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	1.5	3.0	mA

※  $V_{CC}=5.0\text{V} \pm 5\%$ ,  $T_a=25^\circ\text{C}$

### Block diagram



### External dimensions / Display pattern





# DMC32132

• Display Format(32character × 1line) • Display Fonts(5×11dots) • Driving Method( $\frac{1}{11}$ D)

## ABSOLUTE MAXIMUM RATINGS

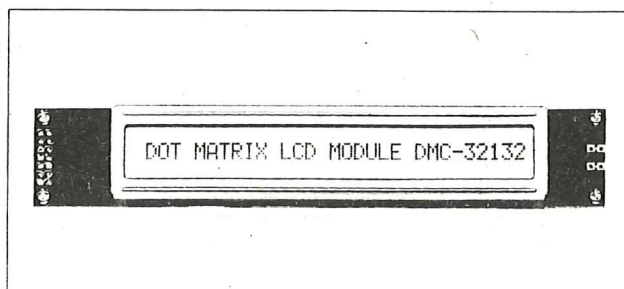
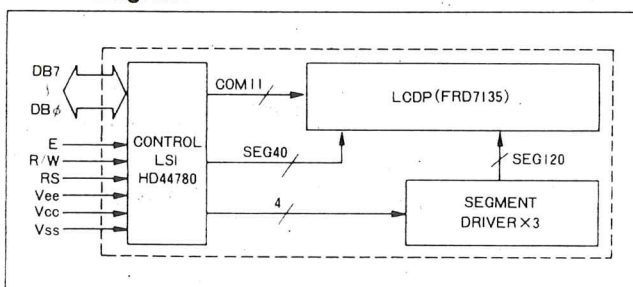
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

## ELECTRICAL CHARACTERISTICS

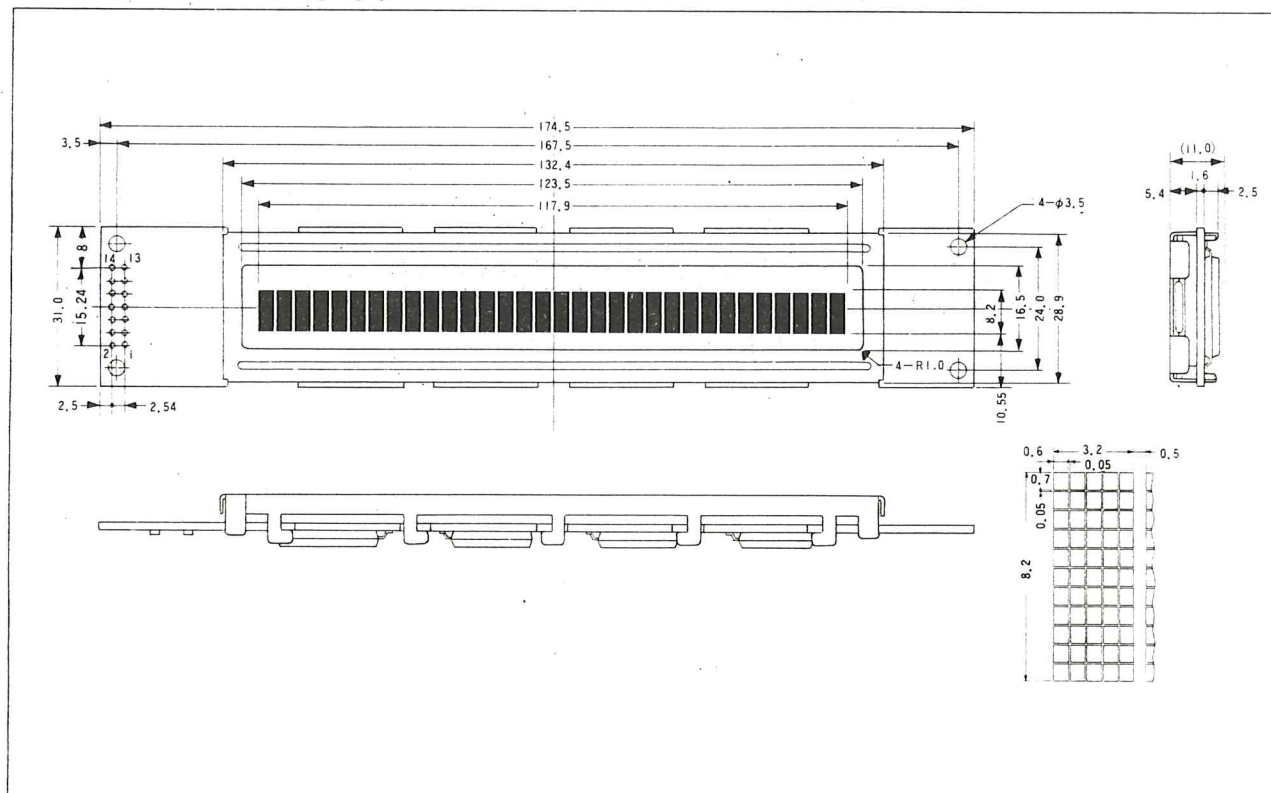
Item	Sym- bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205mA$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2mA$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0V$	—	2.0	4.0	mA

\*  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^\circ C$

## Block diagram



## External dimensions / Display pattern



## DMC32239

• Display Format(32character ×2line) • Display Fonts(5×8dots) • Driving Method( $\frac{1}{6}$ D)

### ABSOLUTE MAXIMUM RATINGS

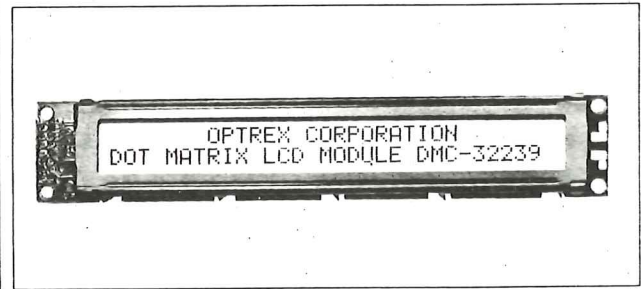
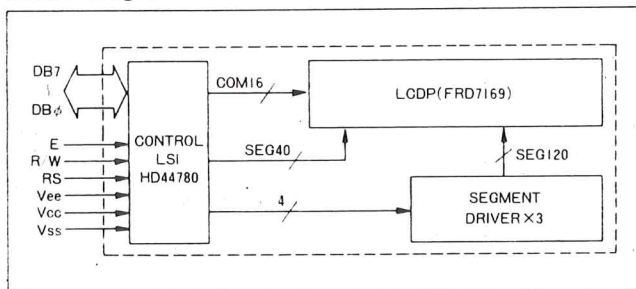
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

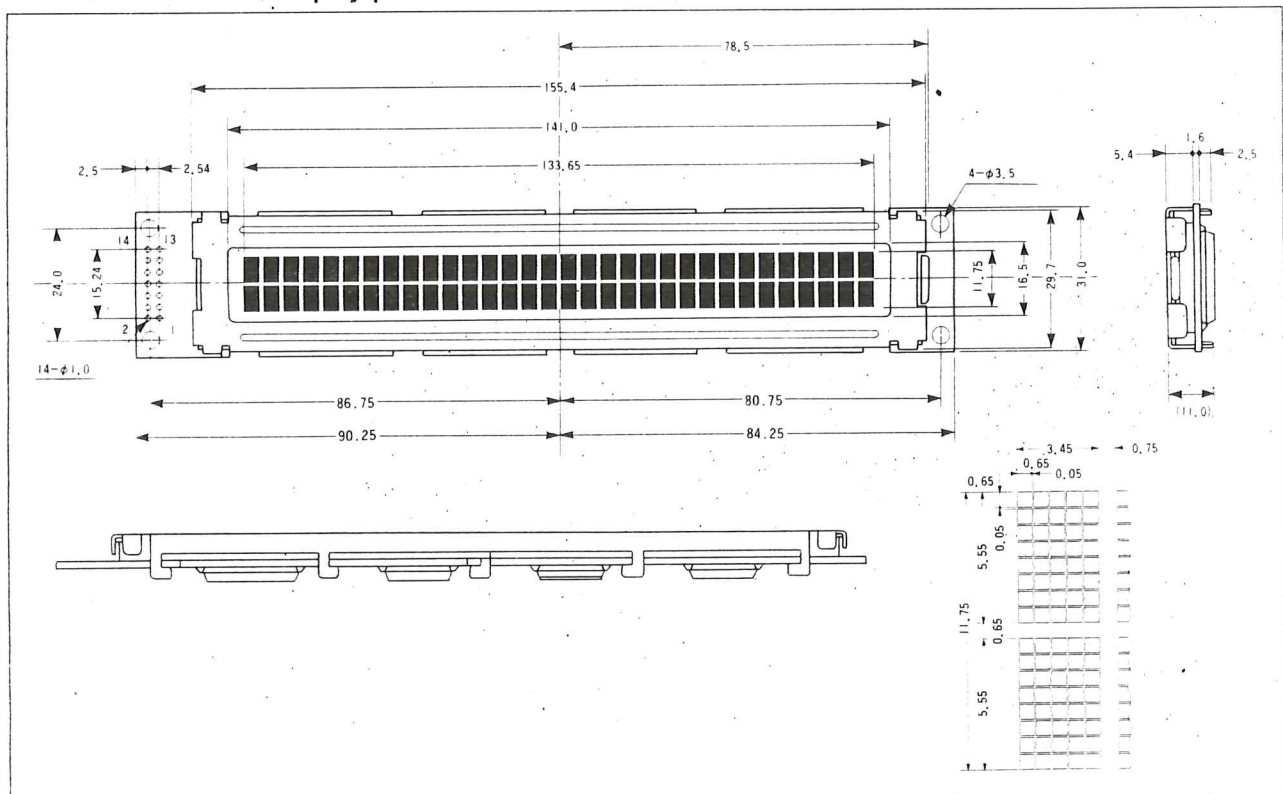
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205mA$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2mA$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0V$	—	2.0	4.0	mA

※  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^\circ C$

### Block diagram



### External dimensions / Display pattern





**DMC32216**

• Display Format(32character ×2line) • Display Fonts(5×8dots) • Driving Method( $\frac{1}{16}$ D)

### ABSOLUTE MAXIMUM RATINGS

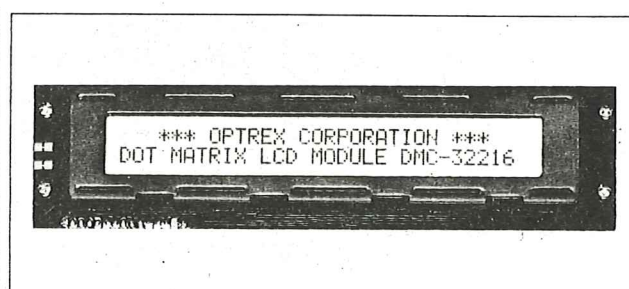
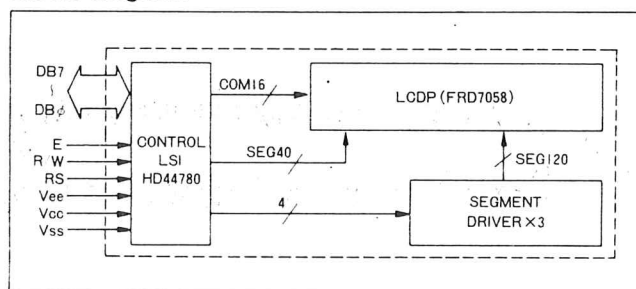
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	−20	—	+70	°C

## ELECTRICAL CHARACTERISTICS

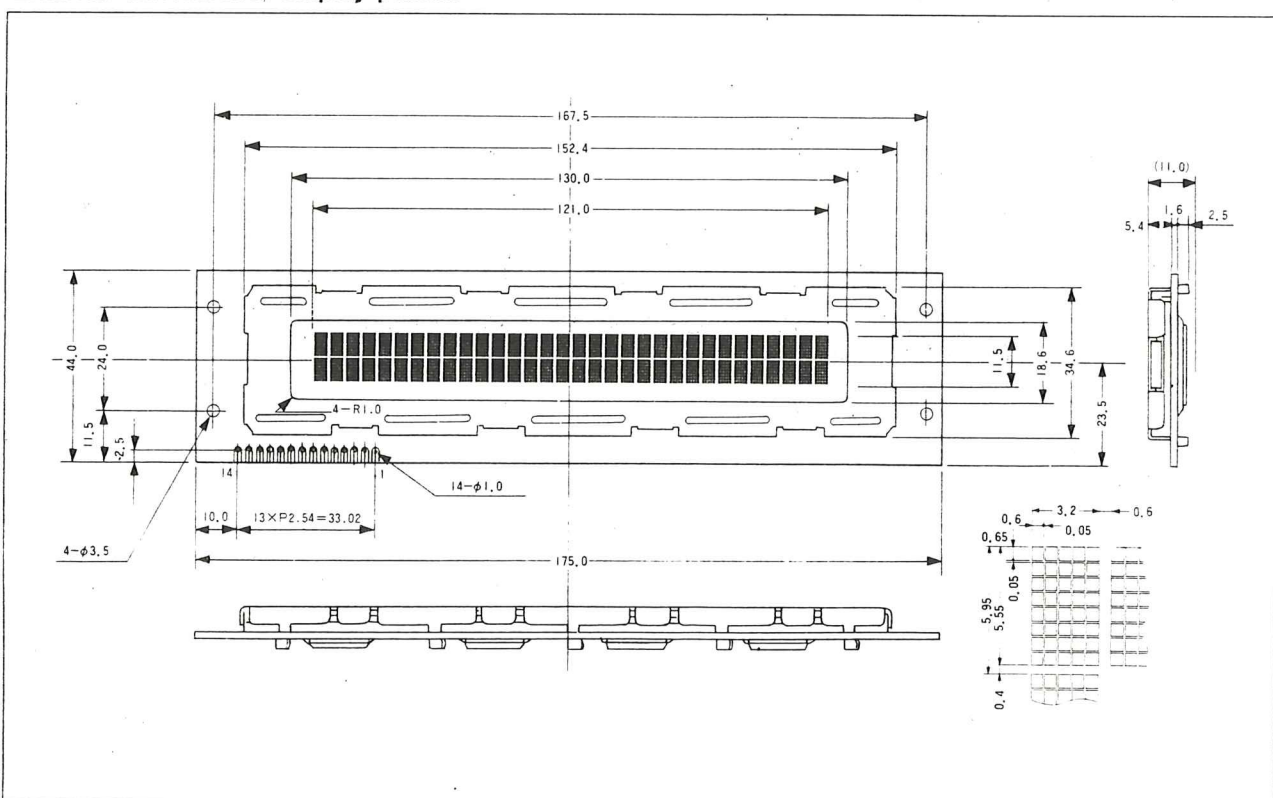
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	2.0	4.0	mA

※  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^{\circ}C$

### Block diagram



### External dimensions / Display pattern



## DMC40131

• Display Format(40character × 1line) • Display Fonts(5 × 11dots) • Driving Method( $\frac{1}{11}D$ )

### ABSOLUTE MAXIMUM RATINGS

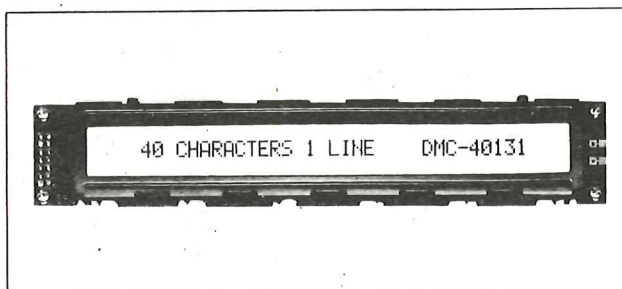
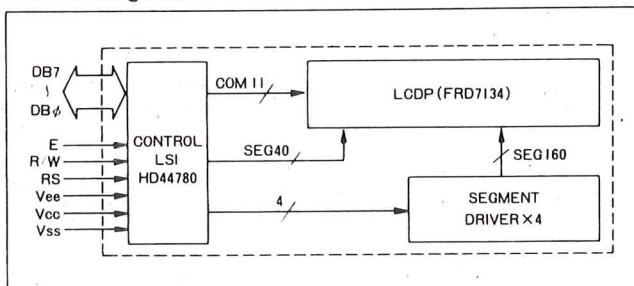
Item	Sym-bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_i$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

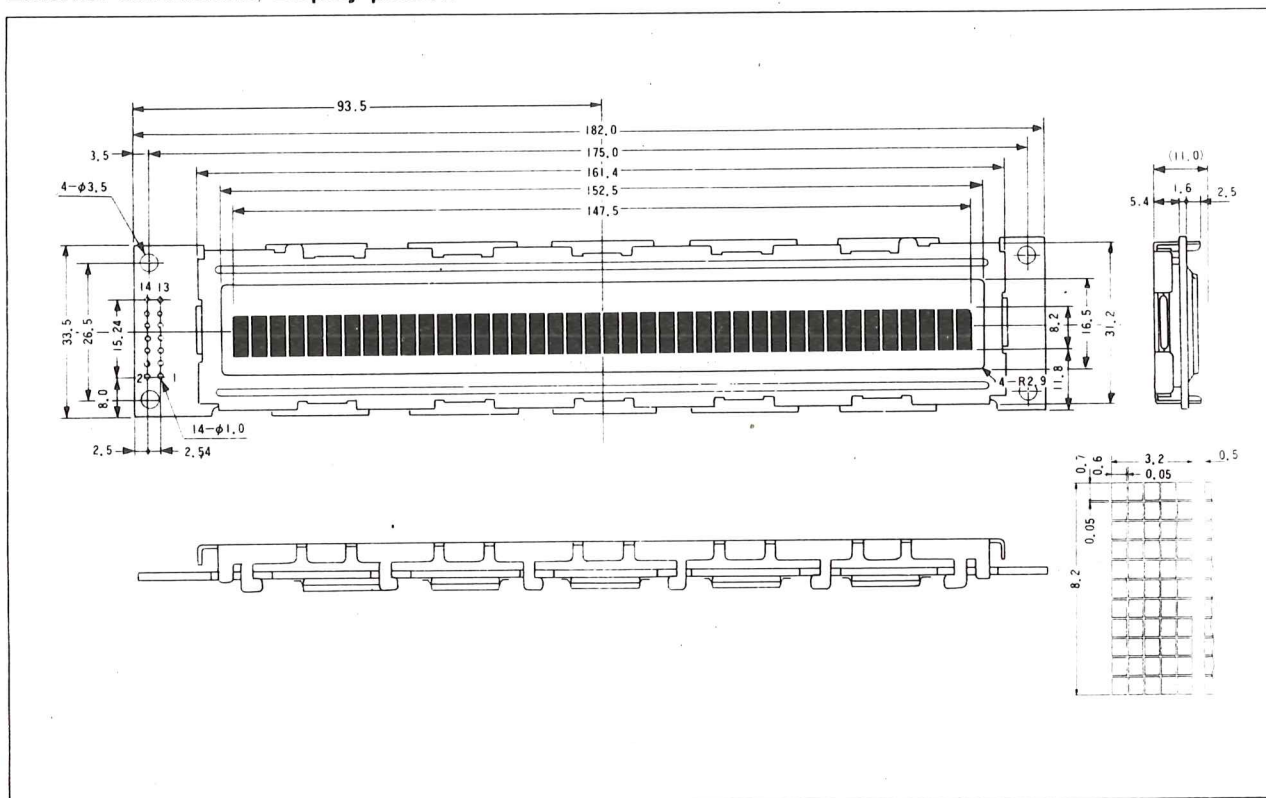
Item	Sym-bol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205mA$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2mA$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0V$	—	2.0	5.0	mA

※  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^\circ C$

### Block diagram



### External dimensions / Display pattern





DMC40218

● Display Format(40character ×2line) ● Display Fonts(5×8dots) ● Driving Method( $\frac{1}{16}$ D)

### ABSOLUTE MAXIMUM RATINGS

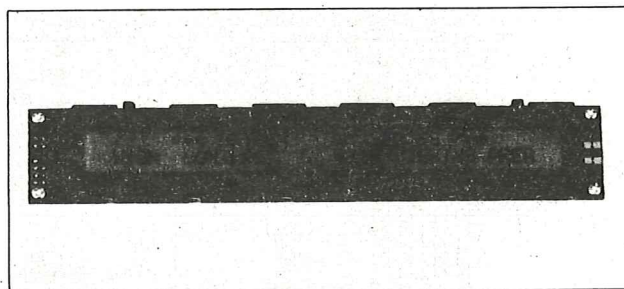
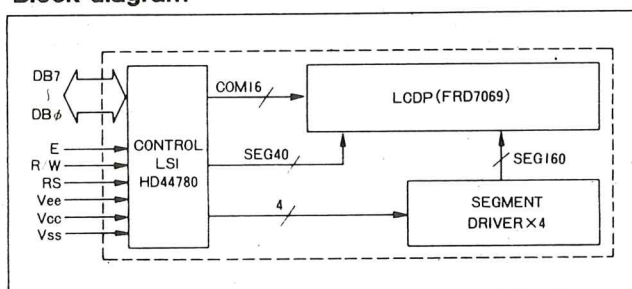
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
Operating Temperature	$T_a$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

## ELECTRICAL CHARACTERISTICS

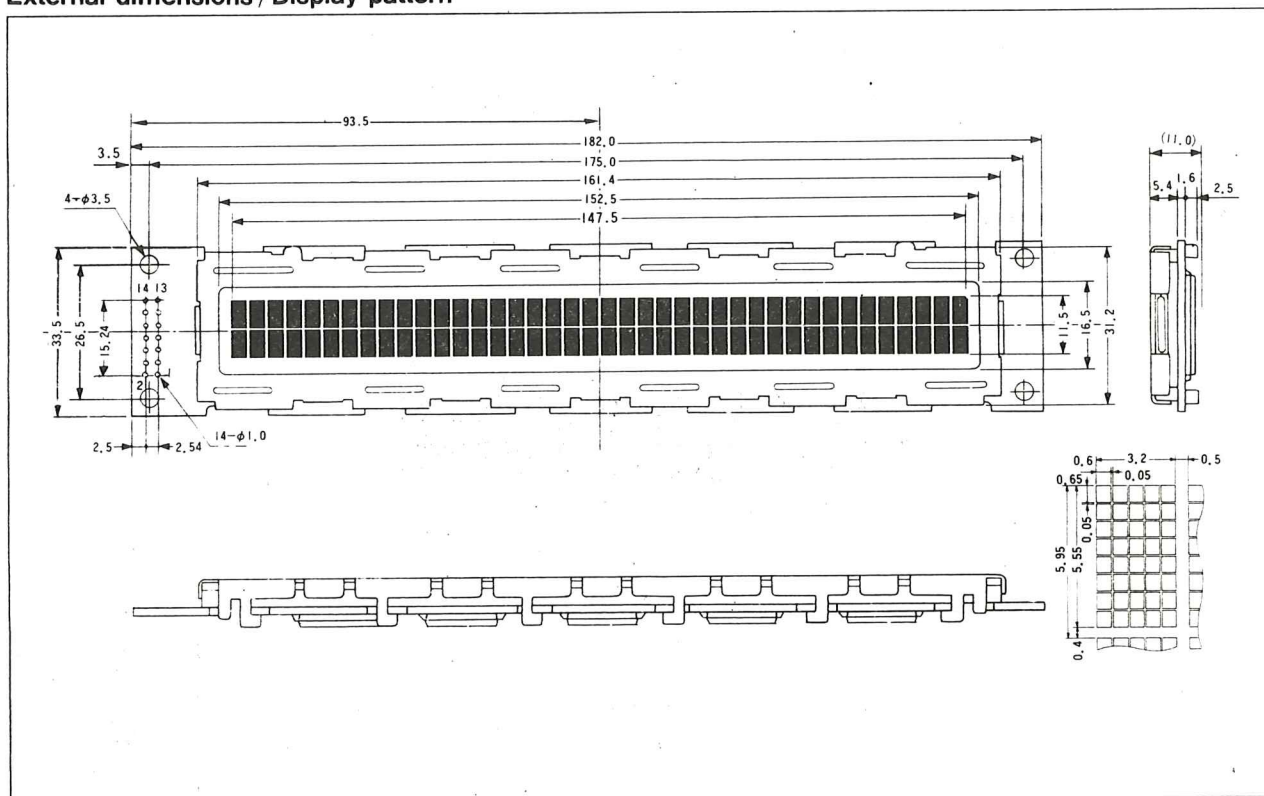
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205\text{ mA}$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OH}=1.2\text{ mA}$	—	—	0.4	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{ V}$	—	2.0	5.0	mA

\*  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^{\circ}C$

### Block diagram



### External dimensions / Display pattern







## DMC16187-YGR (Built-in LED BackLight)

● Display Format (16 character × 1 line) ● Display Fonts (5 × 8 dots) ● Driving Method (1/16D)

### ABSOLUTE MAXIMUM RATINGS

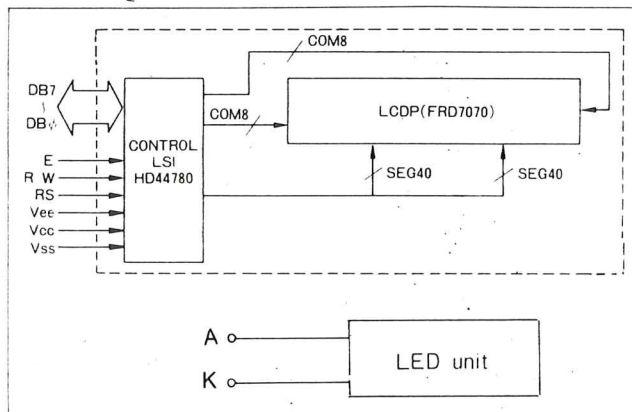
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_I$	—	$V_{SS}$	—	$V_{CC}$	V
LED Forward Current	$I_F$	—	—	—	375	mA
LED Reverse Voltage	$V_R$	—	—	—	6	V
LED Power Loss	$P_D$	—	—	—	1800	mw
Operating Temperature	$T_{opr}$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input Voltage "High" Level	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input Voltage "Low" Level	$V_{IL}$	—	—	—	0.6	V
Output Voltage "High" Level	$V_{OH}$	$-I_{OH}=0.205mA$	2.4	—	—	V
Output Voltage "Low" Level	$V_{OL}$	$I_{OL}=1.2mA$	—	—	4.6	V
LED Forward Current	$V_F$	$I_F=80mA$	3.3	3.8	4.6	V
Bright ness	L	$I_F=50mA$	20	35	—	cd/m <sup>2</sup>
Peak Spectrum	$\lambda_p$	$I_F=50mA$	—	563	—	nm
1/2 Spectrum	$\Delta\lambda$	$I_F=50mA$	—	29	—	nm
Power Supply Current	$I_{CC}$	$V_{CC}=5.0V$	—	1.0	5	mA

\*  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^\circ C$

### Block diagram

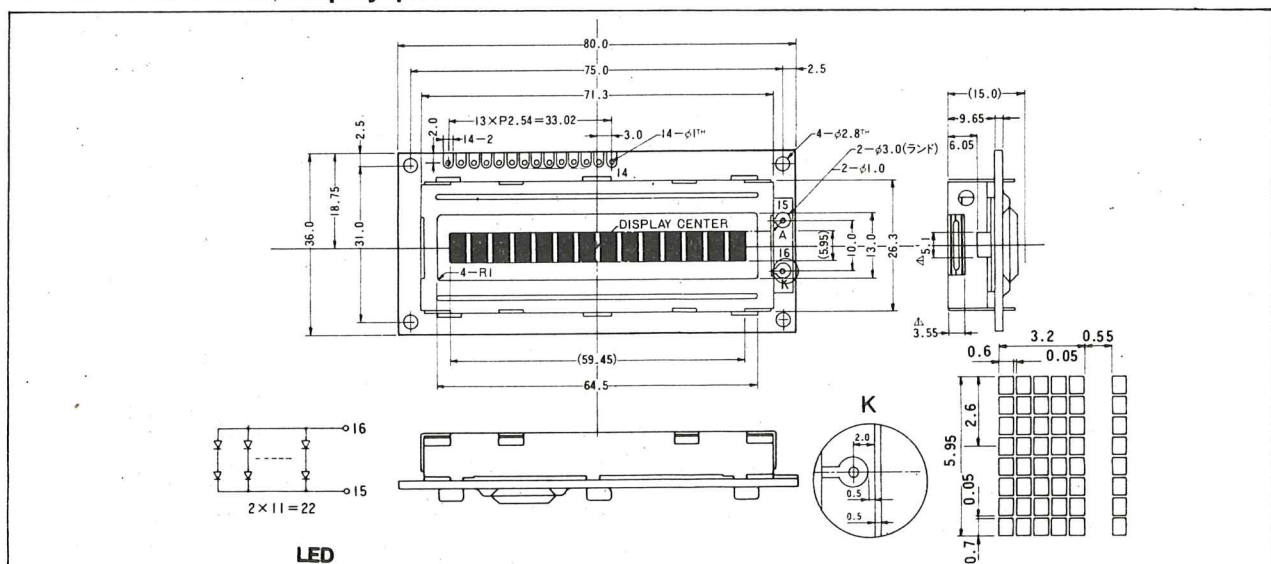


### PIN ASSIGNMENT

NO.	Symbol	Level	Function
1	Vss	—	Power Supply 0v (GND)
2	Vcc	—	Power Supply +5V
3	Vee	—	for Liquid Crystal Drive
4	RS	H/L	Register Selected Signal
5	R/W	H/L	H: Read, L: Write
6	E	H, H←L	Enable Signal
7	DB 0	H/L	Data Bus Line
8	DB 1	H/L	Data Bus Line
9	DB 2	H/L	Data Bus Line
10	DB 3	H/L	Data Bus Line
11	DB 4	H/L	Data Bus Line
12	DB 5	H/L	Data Bus Line
13	DB 6	H/L	Data Bus Line
14	DB 7	H/L	Data Bus Line
15	A	—	LED Anode
16	K	—	LED Cathode

H: Vcc Level L: Vss Level

### External dimensions/Display pattern



# DMC16266-YGR (Built-in LED Back Light)

• Display Format(16character × 2line) • Display Fonts(5 × 8dots) • Driving Method( $\frac{1}{16}$ D)

### ABSOLUTE MAXIMUM RATINGS

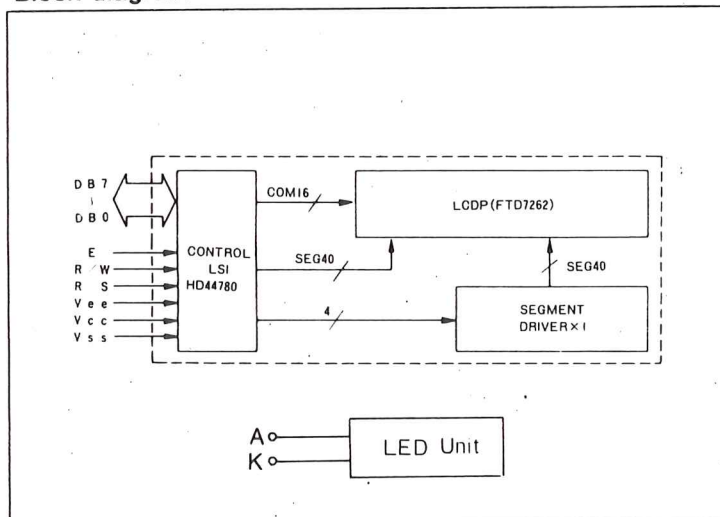
Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$		0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$		0	—	13.5	V
Input Voltage	$V_I$		$V_{SS}$	—	$V_{CC}$	V
LED Forward Current	$I_F$		—	—	375	mA
LED Reverse Voltage	$V_R$		—	—	6	V
LED Power Loss	$P_D$		—	—	1800	mw
Operating Temperature	$T_{opr}$		0	—	+50	°C
Storage Temperature	$T_{stg}$		-20	—	+70	°C

## ELECTRICAL CHARACTERISTICS

Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input Voltage "High" Level	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input Voltage "Low" Level	$V_{IL}$	—	0.3	—	0.6	V
Output Voltage "High" Level	$V_{OH}$	$-I_{OH}=0.205\text{mA}$	2.4	—	—	V
Output Voltage "Low" Level	$V_{OL}$	$I_{OL}=1.2\text{mA}$	—	—	0.4	V
LED Forward Current	$V_F$	$I_F=80\text{mA}$	3.3	3.8	4.6	V
Brightness	L	$I_F=50\text{mA}$	20	35	—	cd/m <sup>2</sup>
Peak Spectrum	$\lambda_P$	$I_F=50\text{mA}$	—	563	—	nm
1/2 Spectrum	$\triangle \lambda$	$I_F=50\text{mA}$	—	29	—	nm
Power Supply Current	$I_{CC}$	$V_{CC}=5.0\text{V}$	—	0.5	2.0	mA

\*  $V_{CC}=5.0V \pm 5\%$ ,  $T_a=25^\circ C$

### Block diagram

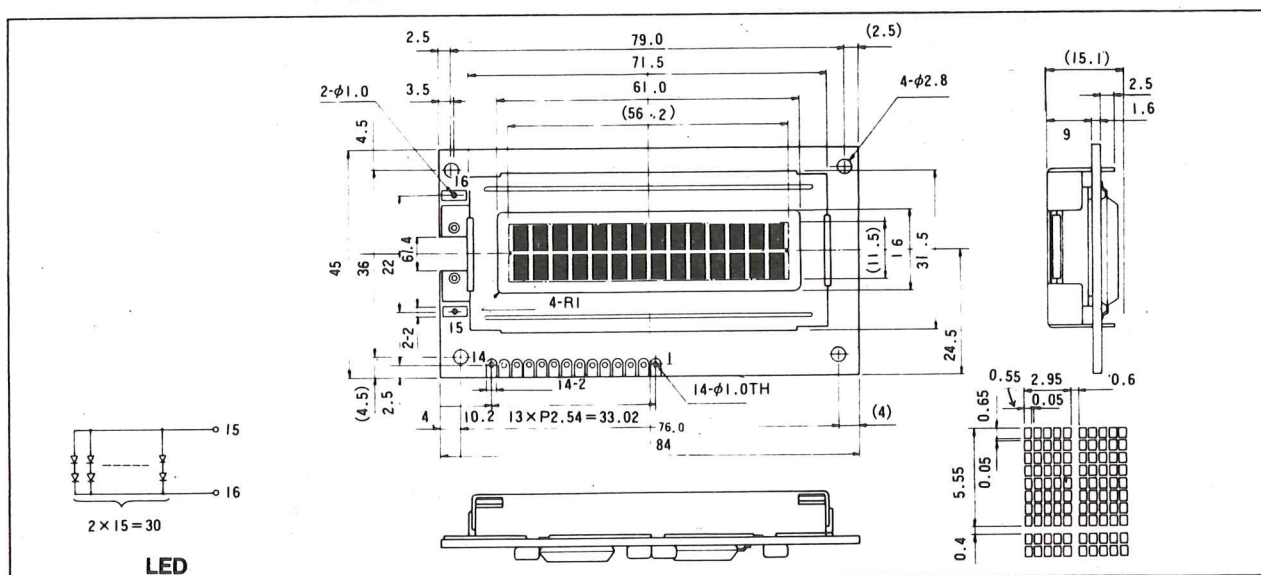


## PIN ASSIGNMENT

NO.	Symbol	Level	Function
1	Vss	——	Power Supply Ov(GND)
2	Vcc	——	Power Supply +5V
3	Vee	——	for Liquid Crystal Drive
4	RS	H/L	Register Selected Signal
5	R/W	H/L	H : READ, L : WRITE
6	E	H, H-L	Enable Signal
7	DB 0	H/L	Data Bus Line
8	DB 1	H/L	Data Bus Line
9	DB 2	H/L	Data Bus Line
10	DB 3	H/L	Data Bus Line
11	DB 4	H/L	Data Bus Line
12	DB 5	H/L	Data Bus Line
13	DB 6	H/L	Data Bus Line
14	DB 7	H/L	Data Bus Line
15	A	——	LED Anode
16	K	——	LED Cathode

H : Vcc Level    L : Vss Level

### External dimensions / Display pattern





## DMC40267-YGR (Built-in LED Back Light)

• Display Format(40character ×2line) • Display Fonts(5×8dots) • Driving Method( $\frac{1}{16}$ D)

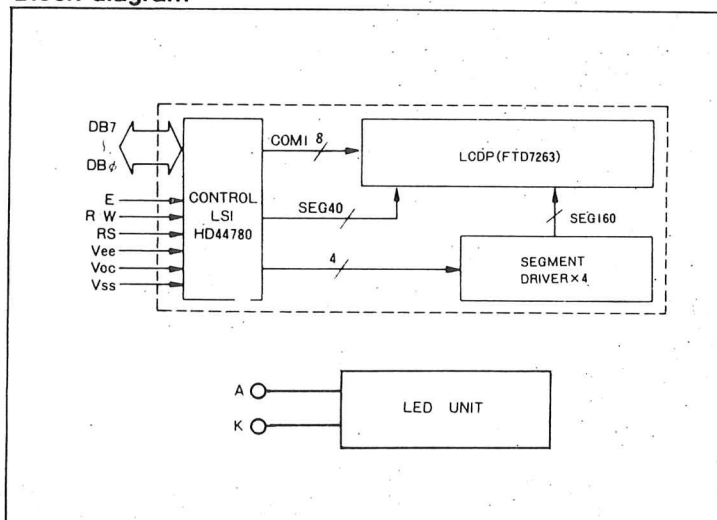
### ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Power Supply Voltage for Logic	$V_{CC} \sim V_{SS}$	—	0	—	7	V
Power Supply Voltage for LCD Drive	$V_{CC} \sim V_{EE}$	—	0	—	13.5	V
Input Voltage	$V_i$	—	$V_{SS}$	—	$V_{CC}$	V
LED Forward Current	$I_F$	—	—	—	975	mA
LED Reverse Voltage	$V_R$	—	—	—	6	V
LED Power Loss	$P_D$	—	—	—	4320	mW
Operating Temperature	$T_{opr}$	—	0	—	+50	°C
Storage Temperature	$T_{stg}$	—	-20	—	+70	°C

### ELECTRICAL CHARACTERISTICS

Item	Symbol	Test Condition	Standard Value			Unit
			min.	typ.	max.	
Input "High" Voltage	$V_{IH}$	—	2.2	—	$V_{CC}$	V
Input "Low" Voltage	$V_{IL}$	—	-0.3	—	0.6	V
Output "High" Voltage	$V_{OH}$	$-I_{OH}=0.205mA$	2.4	—	—	V
Output "Low" Voltage	$V_{OL}$	$I_{OL}=1.2mA$	—	—	0.4	V
LED Forward Current	$I_F$	$I_F=180mA$	3.2	3.7	4.5	V
Power Supply Current	$I_{CC}$	$V_{CC}=5.0V$	—	2.0	5	mA

### Block diagram

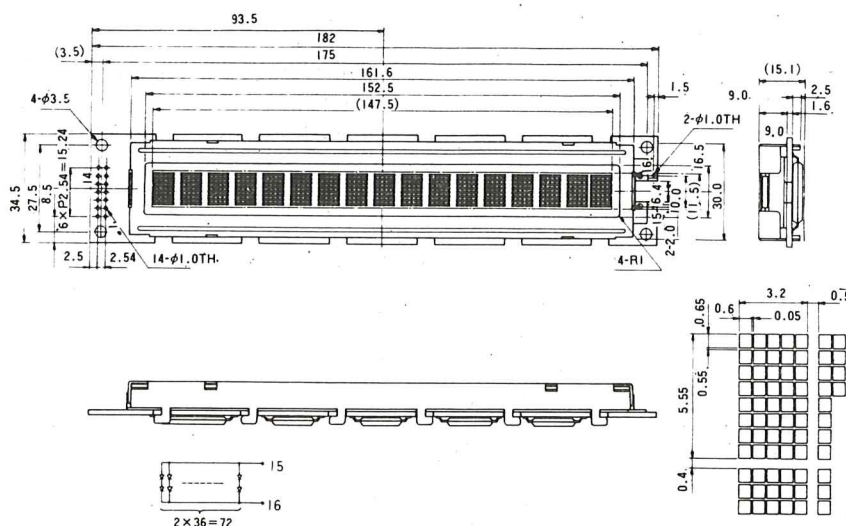


### PIN ASSIGNMENT

NO.	Symbol	Level	Function
1	$V_{SS}$	—	Power Supply 0V(GND)
2	$V_{CC}$	—	Power Supply +5V
3	$V_{EE}$	—	for Liquid Crystal Drive
4	RS	H/L	Register Selected Signal
5	R/W	H/L	H: Read, L: Write
6	E	H, H-L	Enable Signal
7	DB0	H/L	Data Bus Line
8	DB1	H/L	Data Bus Line
9	DB2	H/L	Data Bus Line
10	DB3	H/L	Data Bus Line
11	DB4	H/L	Data Bus Line
12	DB5	H/L	Data Bus Line
13	DB6	H/L	Data Bus Line
14	DB7	H/L	Data Bus Line
15	.A	—	LED Anode
16	K	—	LED Cathode

### External dimensions / Display pattern

H: Vcc Level L: Vss Level



LED

## ELECTRO LUMINESCENCE FOR BACK LIGHT

### FEATURES

- Flexible flat surface light source using organic film as substrate and packaging material.
- Thickness is 1.3mm Max. (1.5mm Max. at the electrode portion). Suitable for high density mounting.
- Emitted color is "blue-green".
- Wide range of drive voltage such as 60~1,000Hz, AC 150V Max. is available. And, with an inverter, step-up voltage from 1.5V battery can be easily done.

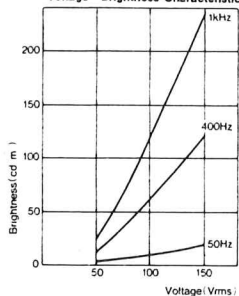
### MAXIMUM RATINGS

OPERATING VOLTAGE	AC150 Vrms
OPERATING TEMP. RANGE	-20 ~ +50°C
STORAGE TEMP. RANGE	-30 ~ +60°C

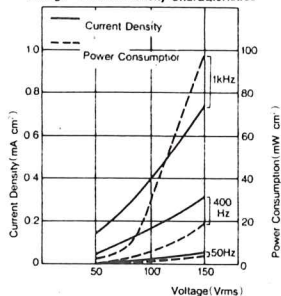
### ELECTRICAL CHARACTERISTICS

(Emitted Color:blue-green)

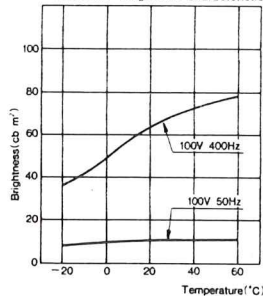
Voltage - Brightness Characteristics



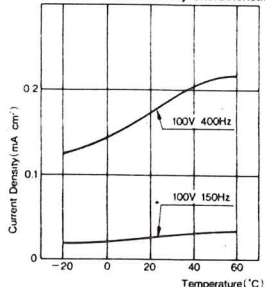
Voltage - Current Density Characteristics



Temperature - Brightness Characteristics

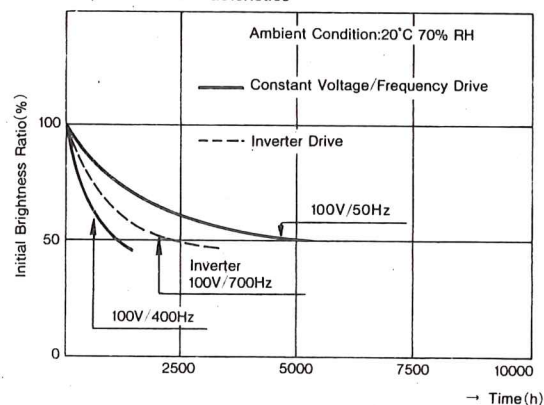


Temperature - Current Density Characteristics

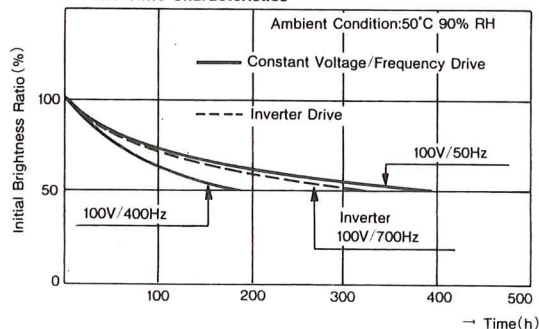


### LIFE TIME

EL Life Time Characteristics



EL Life Time Characteristics



### INVERTER FOR EL

Inverter is required, when DC current such as battery or dry cell is used for power supply.

Inverters have the following characteristics;

- Designed to best suit for organic EL, conversion loss is very small and high efficiency lighting is possible.
- Equipped with constant current characteristics, the inverter can control change of lighting current due to temperature variation and long time lighting and minimize brightness change.

The above diagrams show life time characteristics of EL driven by inverter.



## INVERTER FOR DMC WITH EL

Model No.	Inverter
DMC16106AE	D 32-45
DMC16106CE	D 32-45
DMC16117E	D 32-45
DMC16128E	D 32-45
DMC16129E	D 32-45
DMC16249E	D 32-45
DMC16207E	D 32-45
DMC16230E	D 32-43
DMC16433E	D 32-46
DMC20215E	D 32-46
DMC20434E	D 32-46
DMC24138E	D 32-46
DMC24227E	D 32-46
DMC32132E	D 32-43
DMC32216E	D 32-43
DMC40131E	D 32-43
DMC40218E	D 32-43
DMC40457E	D 32-48

## ADDITIONAL CODINGS FOR DMC MODULES

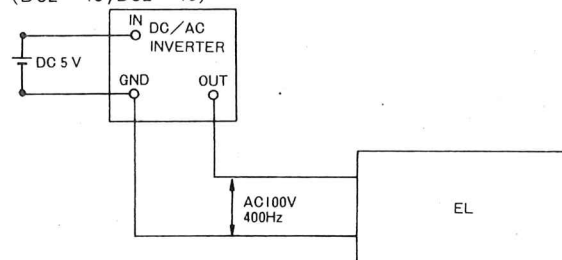
CODE	Additional Specification
1 <b>H</b>	Extended Temperature (Operating Temperature of $-20^{\circ}\text{C} \sim +70^{\circ}\text{C}$ )
2 <b>U</b>	The viewing angle from the "up" side or 12 o'clock side.
3 <b>E</b>	EL illumination (Standard Type only)

## EXTENDED TEMPERATURE MODELS "H" TYPE

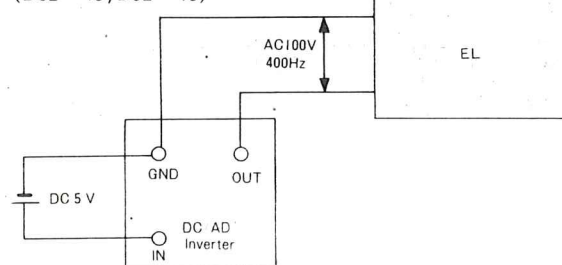
- ① Operating Temperature Range :  $-20^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- ② Storage Temperature Range :  $-30^{\circ}\text{C} \sim +80^{\circ}\text{C}$
- ③ EL is standard type (ref. P34)

## POWER SUPPLY FOR EL (ELECTRO LUMINESCENCE)

(D32-45, D32-46)



(D32-43, D32-48)



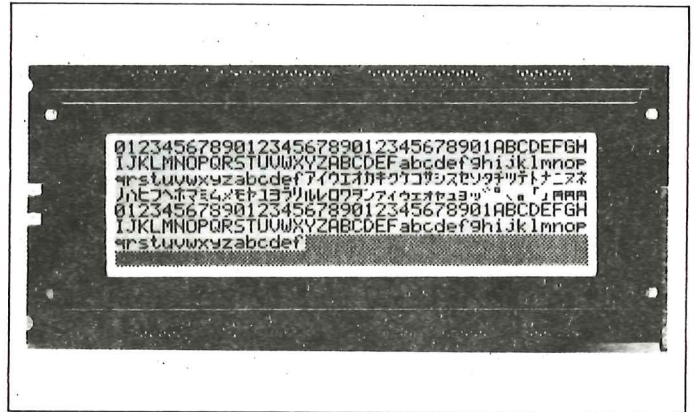
## EXAMPLES OF NEW CODINGS

Basic model : DMC16207  
 Extended : DMC16207H  
 12 O'CLOCK : DMC16207U  
 12 O'CLOCK W/EL : DMC16207UE

# DMF633

## MECHANICAL DATA

Module Dimensions	180 × 75 × 15max(T)mm
Active Viewing Area	132 × 39mm
Dot Pixels	64 × 240dots
Dot Size	0.48 × 0.48mm
Dot Pitch	0.53 × 0.53mm
Weight	160g



## ABSOLUTE MAXIMUM RATINGS

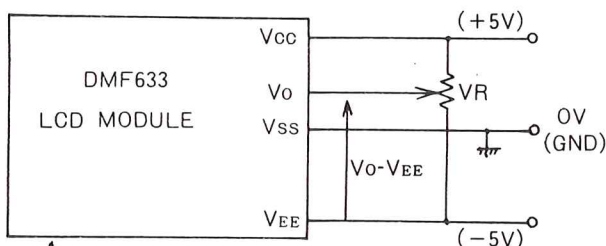
Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	$V_{CC}$ $\sim V_{SS}$	————	-0.3	—	7.0	V
Supply Voltage (LCD Drive)	$V_{CC}$ $\sim V_{EE}$	————	-0.3	—	16.5	V
Input Voltage	$V_I$	————	-0.3	—	$V_{CC}$	V
Operating Temperature	$T_{op}$	————	0	—	+50	°C
Storage Temperature	$T_{stg}$	————	-20	—	+60	°C

## ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	V <sub>CC</sub>	————	4.75	5	5.25	V
Supply Voltage (LCD Drive)	V <sub>EE</sub>	————	9.5	10.0	10.5	V
Power Supply	I <sub>CC</sub>	V <sub>CC</sub> = 5V	—	—	7.6	mA
Power Supply	I <sub>EE</sub>	V <sub>EE</sub> = -5V	—	—	-5.6	mA
Input Voltage *H*Level	V <sub>IH</sub>	————	0.7V <sub>CC</sub>	—	V <sub>CC</sub>	V
Input Voltage *L*Level	V <sub>IL</sub>	————	0	—	0.3V <sub>CC</sub>	V

※  $V_{CC}=5.0V \pm 5\%$ 、 $T_a=25^{\circ}C$

### EXAMPLE OF POWER SUPPLY



$V_o - V_{EE}$  : Power supply of LC drive  
 $V_R$  :  $10\Omega \sim 20k\Omega$

## OPTICAL DATA

$$\overline{T_a = 25^\circ\text{C}}$$

Item	Symbol	Condition	min	typ	max	Unit
Supply Voltage $V_D$ 又は $(V_D) + (V_{EE})$ 1/32duty	$V_{CC}$	Ta= 0℃	8.2	8.4	8.7	V
	$V_{CC}$	Ta=25℃	7.8	8.0	8.3	V
	$V_{EE}$	Ta=50℃	7.0	7.2	7.5	V
Viewing Area	$\theta_2 - \theta_1$	CR = 3	20	—	—	deg
Contrast ratio	CR	Note 1	—	2	—	
Response time(rise)	$\tau_r$	Note 2	—	270	400	mS
Response time(decay)	$\tau_d$	Note 2	—	200	300	mS

<Note1>  $\theta_2 = 20^\circ, \phi = 0^\circ$   
 <Note2>  $V_D = 7.0V, \phi = 20^\circ$

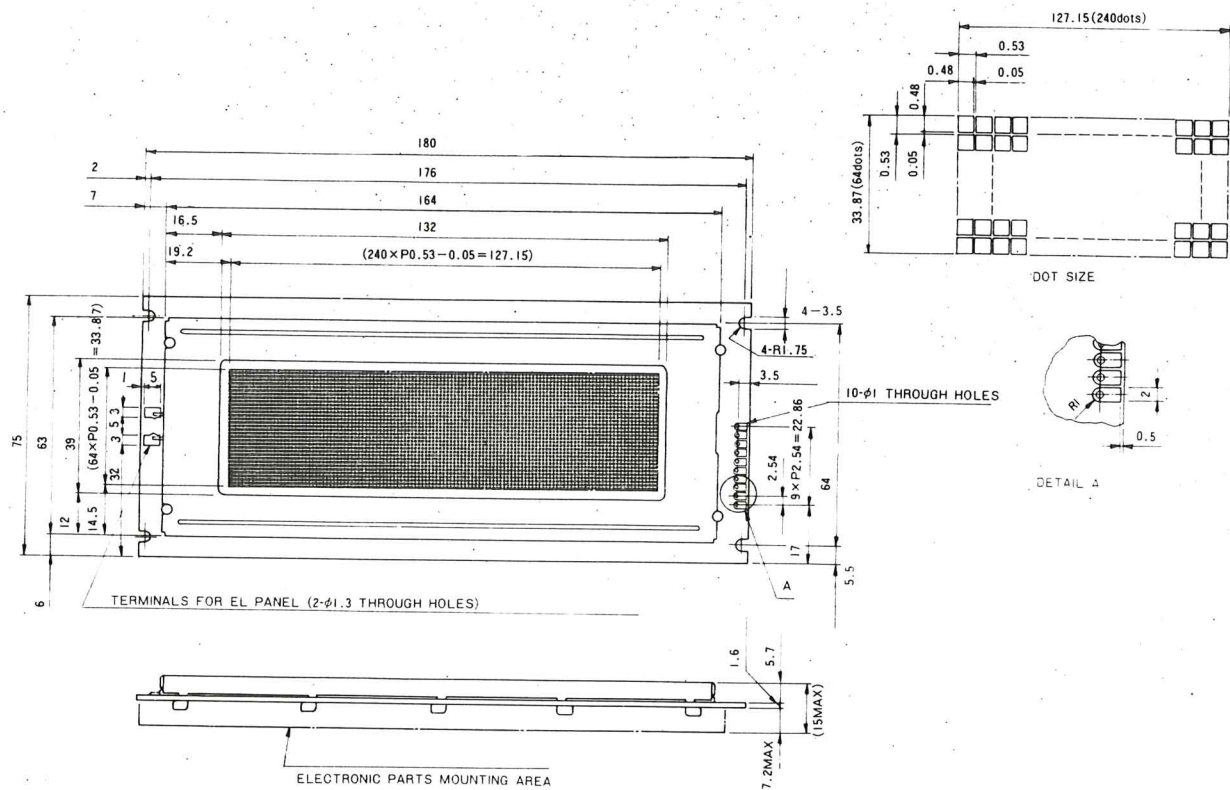
## PIN ASSIGNMENT

Pin No.	Symbol	Level	Function
1	D1	H/L	Display data 1 (Upper)
2	FR	H	Frame Signal
3	DF	H/L	Alternate Signal for LCD Driving
4	LO	H→L	Data Latch Signal
5	CP	H→L	Clock Signal for Shifting Serial Data
6	D2	—	Display Data 2 (Lower)
7	VCC	—	Power Supply for Logic (+5V)
8	VSS	—	Power Supply (0V,GND)
9	VEE	—	Power Supply for LCD Driving (-5V)
10	V <sub>o</sub>	—	Control Voltage for LCD Viewing Angle

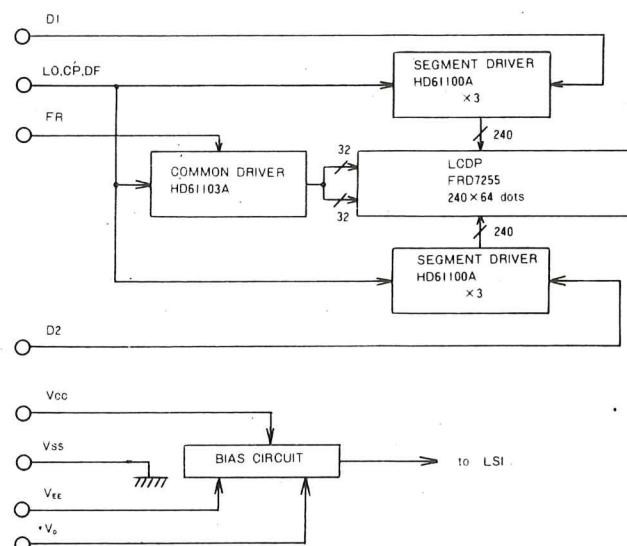
LCD Driving Method	$\frac{1}{2}$ Duty Multiplex Drive
Date Input Method	2-Section Serial Input



## EXTERNAL DIMENSIONS



## BLOCK DIAGRAM

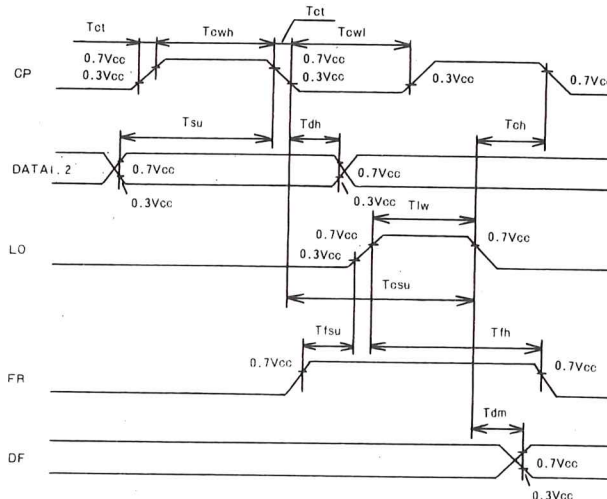


## TIMING CHARACTERISTICS

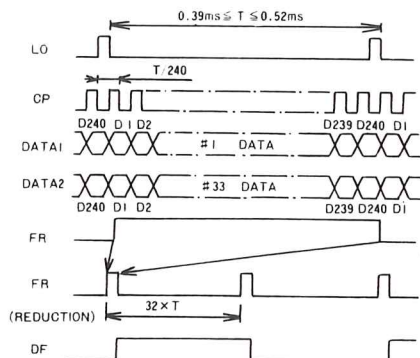
$V_{cc} = 5V \pm 5\%$ ,  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$

Item	Symbol	min.	typ.	max.	Unit
Clock Pulse Width (H Level)	$T_{cwh}$	150	—	—	ns
Clock Pulse Width (L Level)	$T_{cwl}$	150	—	—	ns
Clock Set Up Time	$T_{csu}$	100	—	—	ns
Clock Hold Time	$T_{ch}$	100	—	—	ns
Data Set Up Time	$T_{su}$	80	—	—	ns
Data Hold time	$T_{dh}$	100	—	—	ns
Frame Data Set Up Time	$T_{fsu}$	100	—	—	ns
Frame Data Hold Time	$T_{fh}$	100	—	—	ns
DF Delay Time M Delay Time	$T_{dm}$	—	0	$\pm 300$	ns
Clock Rise/Fall Time	$T_{ct}$	—	—	30	ns
Load Pulse Width	$T_{lw}$	450	—	—	ns

$V_{cc} = 5V \pm 5\%$ ,  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$



## INTERFACE TIMING (DATA READ)





## DMF612

## MECHANICAL DATA

Module Dimensions	260.0×58.0×12.0 mm
Active Viewing Area	229.5×36.0 mm
Dot Pixels	64×480dots
Dot Size	0.41×0.41 mm
Dot Pitch	0.47×0.47 mm
Weight	180 g

## ABSOLUTE MAXIMUM RATINGS

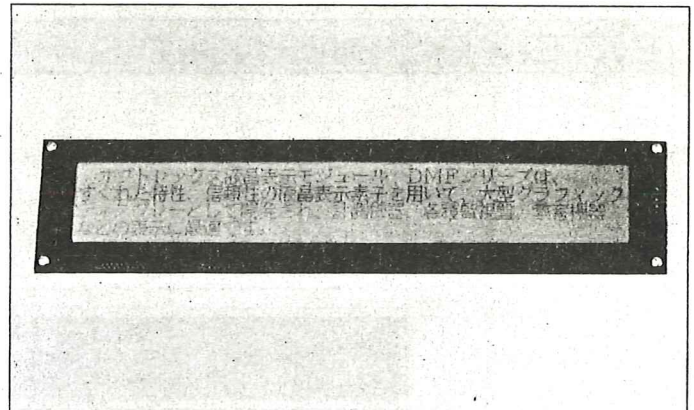
Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	V <sub>CC</sub> ~V <sub>SS</sub>	Ta=25°C	-0.3	—	7.0	V
Supply Voltage (LCD Drive)	V <sub>CC</sub> ~V <sub>EE</sub>	Ta=25°C	0	—	16.5	V
Input Voltage	V <sub>I</sub>	Ta=25°C	V <sub>SS</sub>	—	V <sub>CC</sub>	V
Operating Temperature	Top	—	0	—	+50	°C
Storage Temperature	Tstg	—	-20	—	+60	°C

## ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	V <sub>CC</sub>	—	4.75	5	5.25	V
Supply Voltage (LCD Drive)	V <sub>EE</sub>	—	—	-7.5	—	V
Power Supply	I <sub>CC</sub>	V <sub>CC</sub> =5.0V	—	—	10.0	mA
Power Supply	I <sub>EE</sub>	V <sub>EE</sub> =-7.5V	—	—	9.0	mA
Input Voltage "H" Level	V <sub>IH</sub>	V <sub>CC</sub> =5.0V	3.5	—	5.0	V
Input Voltage "L" Level	V <sub>IL</sub>	V <sub>CC</sub> =5.0V	0	—	1.5	V
Clock Frequency	f <sub>CP</sub>	—	—	—	2.5	MHz

※V<sub>CC</sub>=5.0V±5%、Ta=25°C

LCD Driving Method	I/64 Duty Multiplex Drive
Data Input Method	Serial Input



## OPTICAL DATA

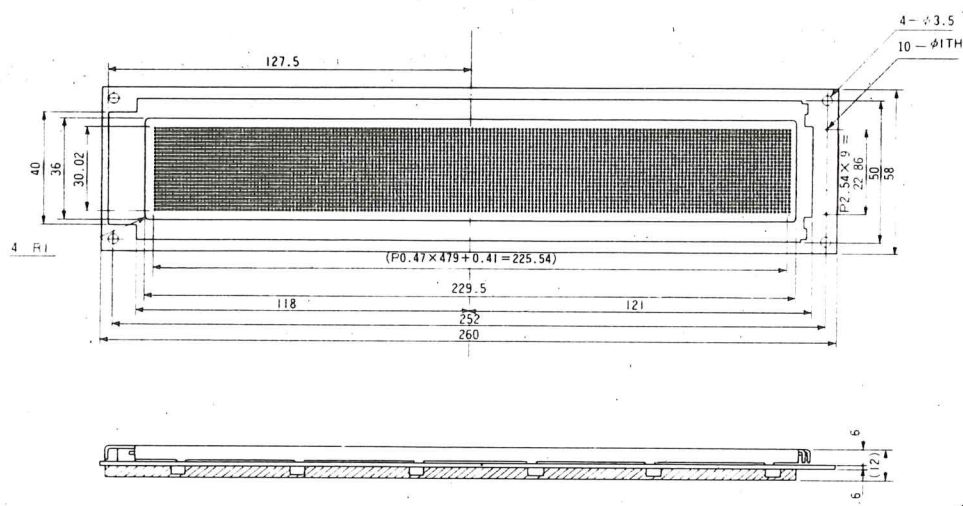
Item	Symbol	Condition	min	typ	max	Unit
Supply Voltage 1/64duty (V <sub>D</sub> )	V <sub>CC</sub> V <sub>EE</sub>	Ta=0°C	13.1	13.9	14.7	V
		Ta=25°C	11.7	12.5	13.3	V
		Ta=50°C	9.5	10.2	10.9	V
Viewing Area	θ <sub>2</sub> -θ <sub>1</sub>	CR=3	20	—	—	deg
Contrast ratio	CR	Note 1	—	5	—	
Response time(rise)	τ <sub>r</sub>	Note 2	—	120	240	mS
Response time(Decay)	τ <sub>d</sub>	Note 2	—	120	240	mS

※ <Note 1> θ<sub>2</sub>=20°, φ=0°<Note 2> V<sub>D</sub>=12.5V, θ=20°

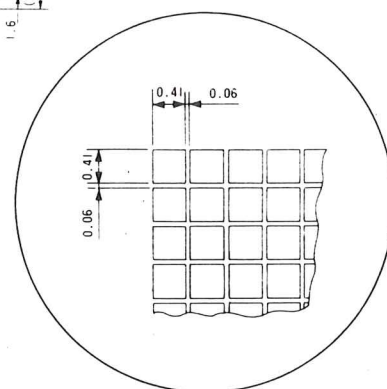
## PIN ASSIGNMENT

Pin No.	Symbol	Level	Function
1	D I	H/L	Display Data I
2	FR	H	Frame Start Signal
3	DF	H/L	Contral Signal for a.c. driving
4	LO	H→L	Data Latch Clock
5	CP	H→L	Data Shift Clock
6	NC	—	No Connection
7	V <sub>CC</sub>	—	Power Supply for Logic Circuit
8	V <sub>SS</sub>	—	Power Supply (GND)
9	V <sub>EE</sub>	—	Power Supply for LC Driving
10	NC	—	No Connection

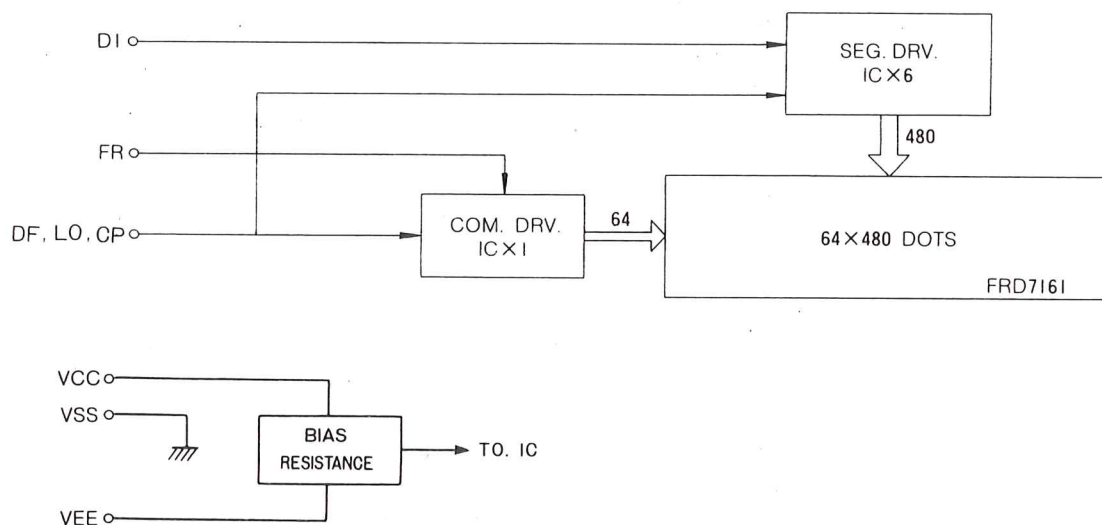
## EXTERNAL DIMENSIONS



## DOT SIZE



## BLOCK DIAGRAM

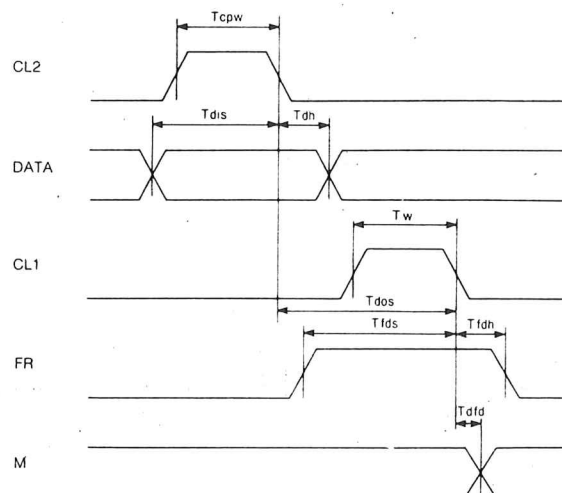




## TIMING CHARACTERISTICS

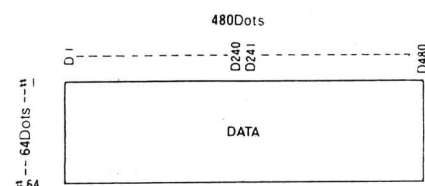
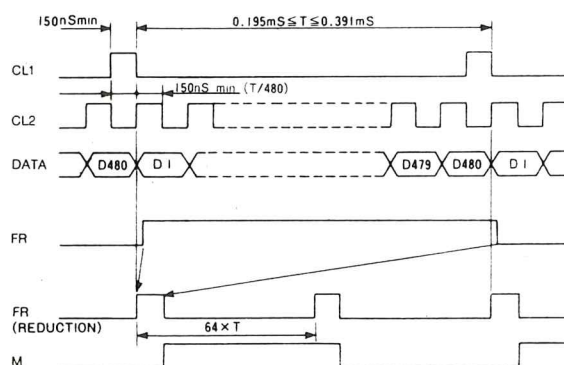
 $V_{CC} = 5V \pm 5\%$ ,  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ 

Item	Symbol	min	typ	max	Unit
Clock pulse width	Tcpw	150			ns
Data set up time	Tdis	80			ns
Data hold time	Tdh	100			ns
Load pulse width	Tlw	150			ns
Clock set up time	Tdos	100			ns
Frame data set up time	Tfds	100			ns
Frame data hold time	Tfdh	100			ns
DF delay time	Tdfd		0	300	ns



## INTERFACE TIMING (DATA READ)

Comparison of display and data



## DMF608

## MECHANICAL DATA

Module Dimensions	129.0 × 102.0 × 11.2 mm
Active Viewing Area	101.0 × 82.0 mm
Dot Pixels	128 × 160dots
Dot Size	0.55 × 0.55 mm
Dot Pitch	0.6 × 0.6 mm
Weight	170 g



## ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	$V_{CC}$ $\sim V_{SS}$	$T_a = 25^\circ\text{C}$	-0.3	—	7.0	V
Supply Voltage (LCD Drive)	$V_{CC}$ $\sim V_{EE}$	$T_a = 25^\circ\text{C}$	0	—	16.0	V
Input Voltage	$V_I$	$T_a = 25^\circ\text{C}$	-0.3	—	$V_{CC}$	V
Operating Temperature	$T_{op}$	—	0	—	+50	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	—	-20	—	+60	$^\circ\text{C}$

## OPTICAL DATA

 $T_a = 25^\circ\text{C}$ 

Item	Symbol	Condition	min	typ	max	Unit
Supply Voltage 1/64 duty ( $V_D$ )	$V_{CC}$ $\sim V_{EE}$	$T_a = 0^\circ\text{C}$	13.1	13.9	14.7	V
		$T_a = 25^\circ\text{C}$	11.7	12.5	13.3	V
		$T_a = 50^\circ\text{C}$	9.5	10.2	10.9	V
Viewing Area	$\theta_2 - \theta_1$	CR = 3	20	—	—	deg
Contrast ratio	CR	Note 1	—	5	—	
Response time(rise)	$\tau_r$	Note 2		120	240	mS
Response time(decay)	$\tau_d$	Note 2		120	240	mS

※ <Note1>  $\theta_2 = 20^\circ$ ,  $\phi = 0^\circ$   
 <Note2>  $V_D = 12.5\text{V}$ ,  $\theta = 20^\circ$

&lt;See page 14&gt;

## ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	$V_{CC}$ $\sim V_{SS}$		4.75	5.0	5.25	V
Supply Voltage (LCD Drive)	$V_{EE}$ $\sim V_{SS}$			-7.5		V
Power Supply	$I_{CC}$	$V_{CC} = 5\text{V}$ $V_{EE} = -7.5\text{V}$			5.0	mA
Power Supply	$I_{EE}$	$V_{CC} = 5\text{V}$ $V_{EE} = -7.5\text{V}$			4.5	mA
Input Voltage "H" Level	$V_{IH}$		3.6			V
Input Voltage "L" Level	$V_{IL}$				0.8	V
Clock Frequency	f <sub>cp</sub>				1.2	MHz

## PIN ASSIGNMENT

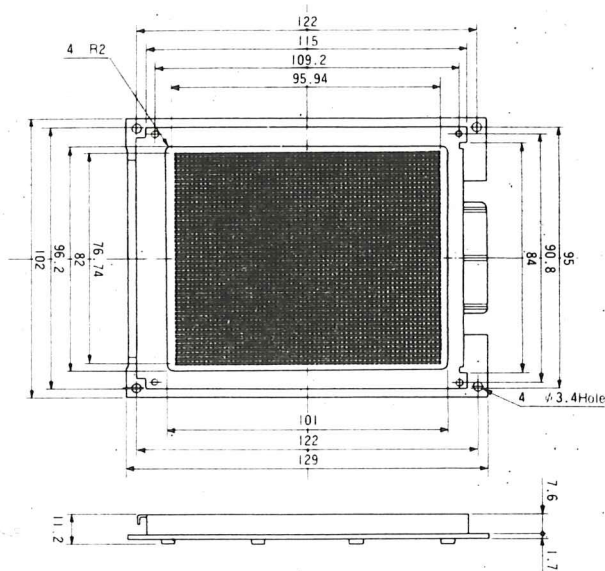
Pin No	Symbol	Level	Function
1	NC	—	No Connection
2	NC	—	No Connection
3	NC	—	No Connection
4	Data 2	H/L	Display Data(Lower) H:ON L:OFF
5	Data 1	H/L	Display Data(Upper) H:ON L:OFF
6	FR	H	Frame Signal
7	DF	H/L	Alternate Signal for LCD Driving
8	LO	H→L	Data Latch Signal
9	CP	H→L	Check Signal for Shifting Serial Data
10	$V_{CC}$	—	Power Supply for Logic Circuit
11	$V_{SS}$	—	0V
12	$V_{EE}$	—	Power Supply for LCD Driving
13	NC	—	No Connection
14	NC	—	No Connection
15	NC	—	No Connection

LCD Driving Method	1/64 Duty Multiplex Drive
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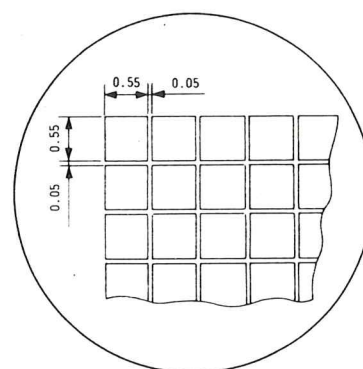
Data Input Method	2-Section Serial Input
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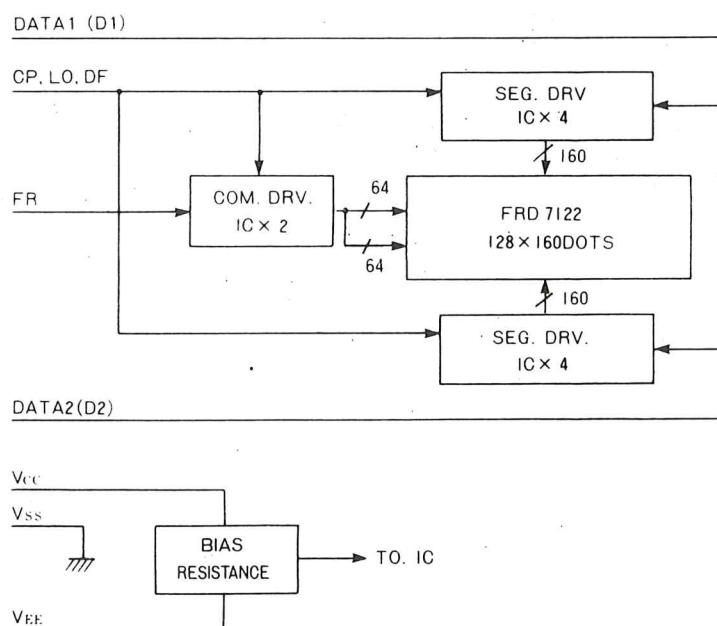
## EXTERNAL DIMENSIONS



## DOT SIZE



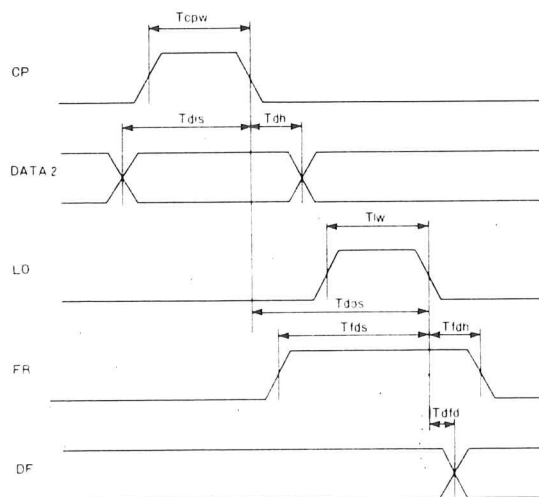
## BLOCK DIAGRAM



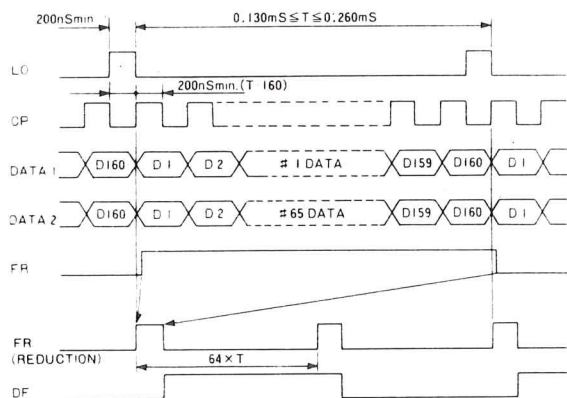
## TIMING CHARACTERISTICS

 $V_{CC} = 5V \pm 5\%$ ,  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ 

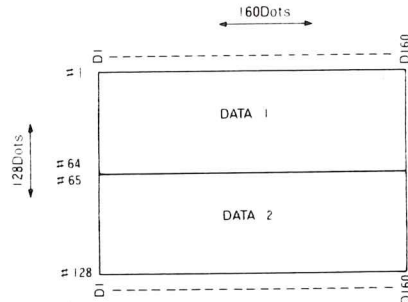
Item	Symbol	min	typ	max	Unit
Clock pulse width	Tcpw	200			ns
Data set up time	Tdis	40			ns
Data hold time	Tdh	400			ns
Load pulse width	TLw	200			ns
Data out set up time	Tdos	560			ns
Frame data set up time	Tfds	100			ns
Frame data hold time	Tfdh	800			ns
DF delay time	Tdfd		0	1000	ns



## INTERFACE TIMING (DATA READ)



Comparison of display and data

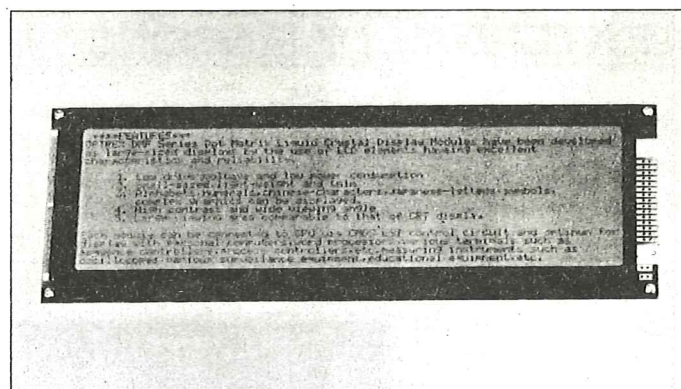




## DMF605

## MECHANICAL DATA

Module Dimensions	259.0 × 90.0 × 12.6mm
Active Viewing Area	229.5 × 66.0mm
Dot Pixels	128 × 480dots
Dot Size	0.41 × 0.41mm
Dot Pitch	0.47 × 0.47mm
Weight	300 g



## ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	$V_{CC} \sim V_{SS}$	$T_a = 25^\circ\text{C}$	-0.3	—	6.0	V
Supply Voltage (LCD Drive)	$V_{CC} \sim V_{EE}$	$T_a = 25^\circ\text{C}$	0	—	18.0	V
Input Voltage	$V_I$	$T_a = 25^\circ\text{C}$	-0.3	—	$V_{CC} + 0.3$	V
Operating Temperature	$T_{op}$	—	0	—	+50	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	—	-20	—	+60	$^\circ\text{C}$

## OPTICAL DATA

 $T_a = 25^\circ\text{C}$ 

Item	Symbol	Condition	min	typ	max	Unit
Supply Voltage 1/64 duty ( $V_D$ )	$V_{CC} \sim V_{EE}$	$T_a = 0^\circ\text{C}$	13.1	13.9	14.7	V
		$T_a = 25^\circ\text{C}$	11.7	12.5	13.3	V
		$T_a = 50^\circ\text{C}$	9.5	10.2	10.9	V
Viewing Area	$\theta_2 - \theta_1$	$CR = 3$	20	—	—	deg
Contrast ratio	CR	Note 1	—	5	—	
Response time(rise)	$\tau_r$	Note 2	—	120	240	mS
Response time(decay)	$\tau_d$	Note 2	—	120	240	mS

\* <Note1>  $\theta_2 = 20^\circ$ ,  $\phi = 0^\circ$ <Note2>  $V_D = 12.5\text{V}$ ,  $\theta = 20^\circ$ 

&lt;See page 14&gt;

## ELECTRICAL CHARACTERISTICS

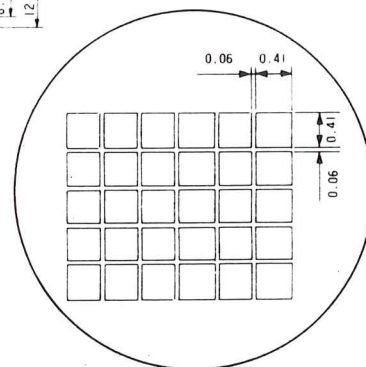
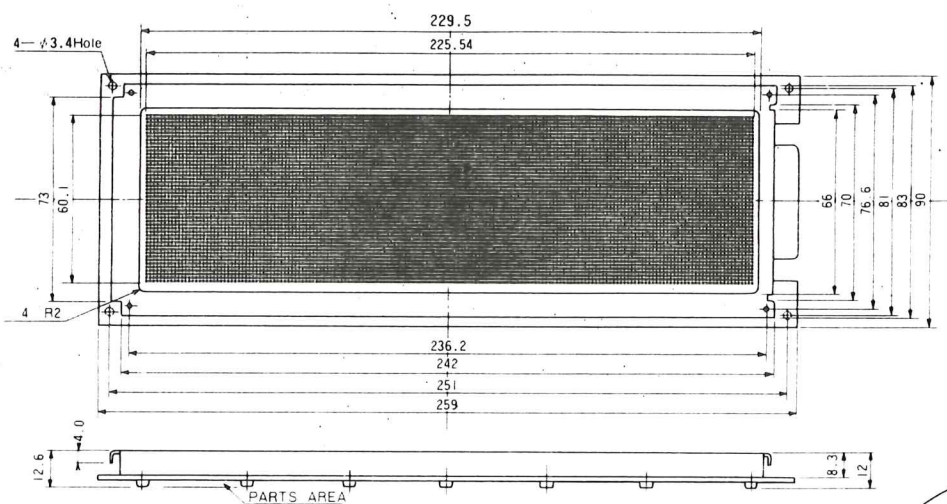
Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	$V_{CC} \sim V_{SS}$	—	4.75	5.0	5.25	V
Supply Voltage (LCD Drive)	$V_{EE} \sim V_{SS}$	—	—	-7.5	—	V
Power Supply	$I_{CC}$	$V_{CC} = 5\text{V}$ $V_{EE} = -7.5\text{V}$	—	14.0	—	mA
Power Supply	$I_{EE}$	$V_{CC} = 5\text{V}$ $V_{EE} = -7.5\text{V}$	—	4.5	—	mA
Input Voltage *H*Level	$V_{IH}$	—	0.8 $V_{CC}$	—	—	V
Input Voltage *L*Level	$V_{IL}$	—	—	—	0.2 $V_{CC}$	V
Clock Frequency	fcp	duty=50%	—	—	3.3	MHz

## PIN ASSIGNMENT

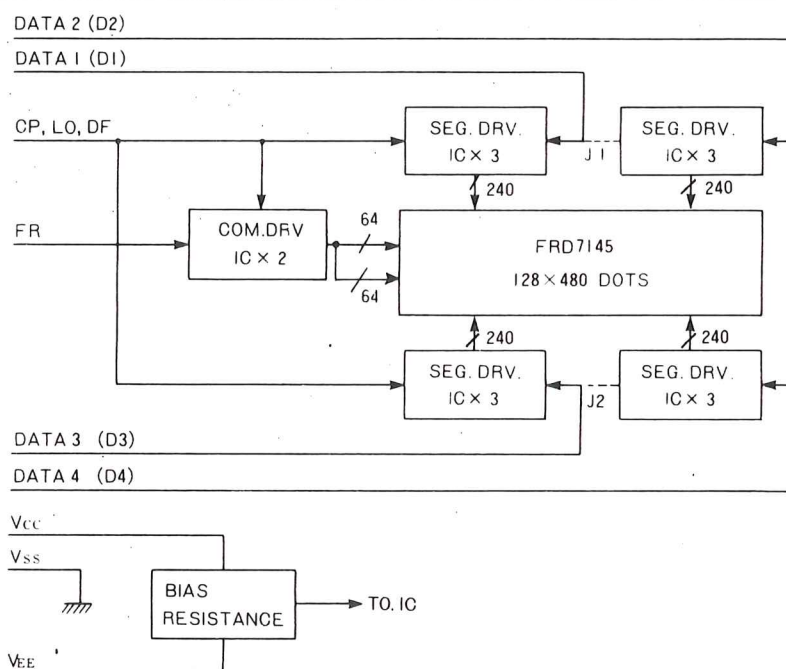
Pin No.	Symbol	Level	Function
1	NC	—	No Connection
2	Data 4	H/L	Display Data(Lower Right) H:ON L:OFF
3	Data 3	H/L	Display Data(Lower Left) H:ON L:OFF
4	Data 2	H/L	Display Data(Upper Right) H:ON L:OFF
5	Data 1	H/L	Display Data(Upper Left) H:ON L:OFF
6	FR	H	Frame Signal
7	DF	H/L	Alternate Signal for LCD Driving
8	LO	H→L	Data Latch Signal
9	CP	H→L	Check Signal for Snifting Serial data
10	$V_{CC}$	—	Power supply for Logic Circuit
11	$V_{SS}$	—	0 V
12	$V_{EE}$	—	Power Supply for LCD Driving
13	NC	—	No Connection
14	NC	—	No Connection
15	NC	—	No Connection

LCD Driving Method	1/64 Duty Multiplex Drive
Data Input Method	4-Section Serial Input

## EXTERNAL DIMENSIONS



## BLOCK DIAGRAM

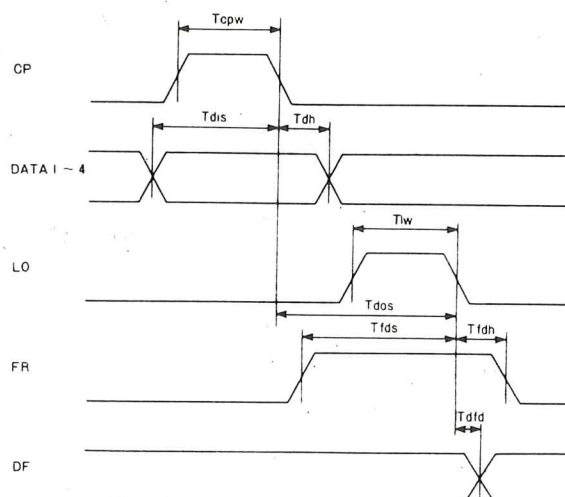




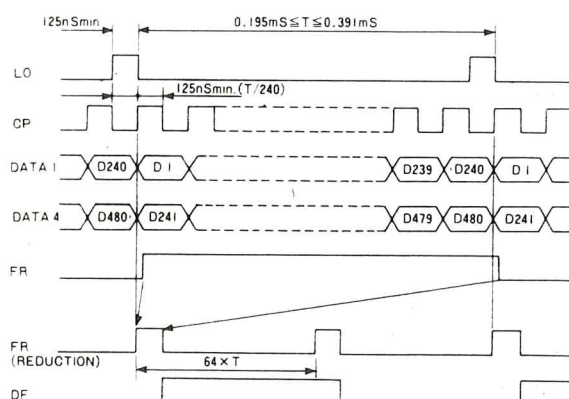
## TIMING CHARACTERISTICS

 $V_{CC} = 5V \pm 5\%$ ,  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ 

Item	Symbol	min	typ	max	Unit
Clock pulse width	Tcpw	125			ns
Data set up time	Tdis	50			ns
Data hold time	Tdh	50			ns
Load pulse width	Tlw	125			ns
Data out set up time	Tdos	250			ns
Frame data set up time	Tfds	50			ns
Frame data hold time	Tfdh	50			ns
DF delay time	Tdfd		0	1000	ns



## INTERFACE TIMING (DATA READ)



## DMF613

### MECHANICAL DATA

Module Dimensions	275.0 × 126.0 × 10.8 mm
Active Viewing Area	232.0 × 106.0 mm
Dot Pixels	200 × 640dots
Dot Size	0.31 × 0.45 mm
Dot Pitch	0.35 × 0.49 mm
Weight	370 g



### ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Standard Value			Unit
			min	typ.	max	
Supply Voltage (Logic)	$V_{CC} \sim V_{SS}$	$T_a = 25^\circ C$	-0.3	—	6	V
Supply Voltage (LCD Drive)	$V_{CC} \sim V_{EE}$	$T_a = 25^\circ C$	0	—	22	V
Input Voltage	$V_I$	$T_a = 25^\circ C$	-0.3	—	$V_{CC} + 0.3$	V
Operating Temperature	Top	—	0	—	+50	°C
Storage Temperature	Tstg	—	-20	—	+60	°C

### ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	$V_{CC} \sim V_{SS}$	—	4.75	5.0	5.25	V
Supply Voltage (LCD Drive)	$V_{EE} \sim V_{SS}$	$V_{CC} = 5V, T_a = 25^\circ C$	—	-10.6	—	V
Power Supply	$I_{CC}$	$V_{CC} = 5V, V_{EE} = -10.6V$	—	—	23	mA
Power Supply	$I_{EE}$	//	—	—	20	mA
Input Voltage "H" Level	$V_{IH}$	—	0.8V <sub>CC</sub>	—	—	V
Input Voltage "L" Level	$V_{IL}$	—	—	—	0.2V <sub>CC</sub>	V
Clock Frequency	f <sub>CP</sub>	duty = 50%	—	—	3.0	MHz

LCD Driving Method	I/100 Duty Multiplex Drive
Data Input Method	2-Sections 4bit Parallel Input

### OPTICAL DATA

 $T_a = 25^\circ C$ 

Item	Symbol	Condition	min	typ	max	Unit
Supply Voltage I/100duty (V <sub>D</sub> )	$V_{CC} \sim V_{EE}$	$T_a = 0^\circ C$	17.3	18.4	19.4	V
		$T_a = 25^\circ C$	15.8	16.6	17.3	V
		$T_a = 50^\circ C$	12.7	12.9	13.1	V
Viewing Area	$\theta_2 - \theta_1$	CR = 3	20	—	—	deg
Contrast ratio	CR	(Note1)	—	2	—	—
Response time(rise)	$\tau_r$	(Note2)	—	120	240	mS
Response time(decay)	$\tau_d$	(Note2)	—	120	240	mS

<Note1>  $\theta_2 = 20^\circ, \phi = 0^\circ$ 

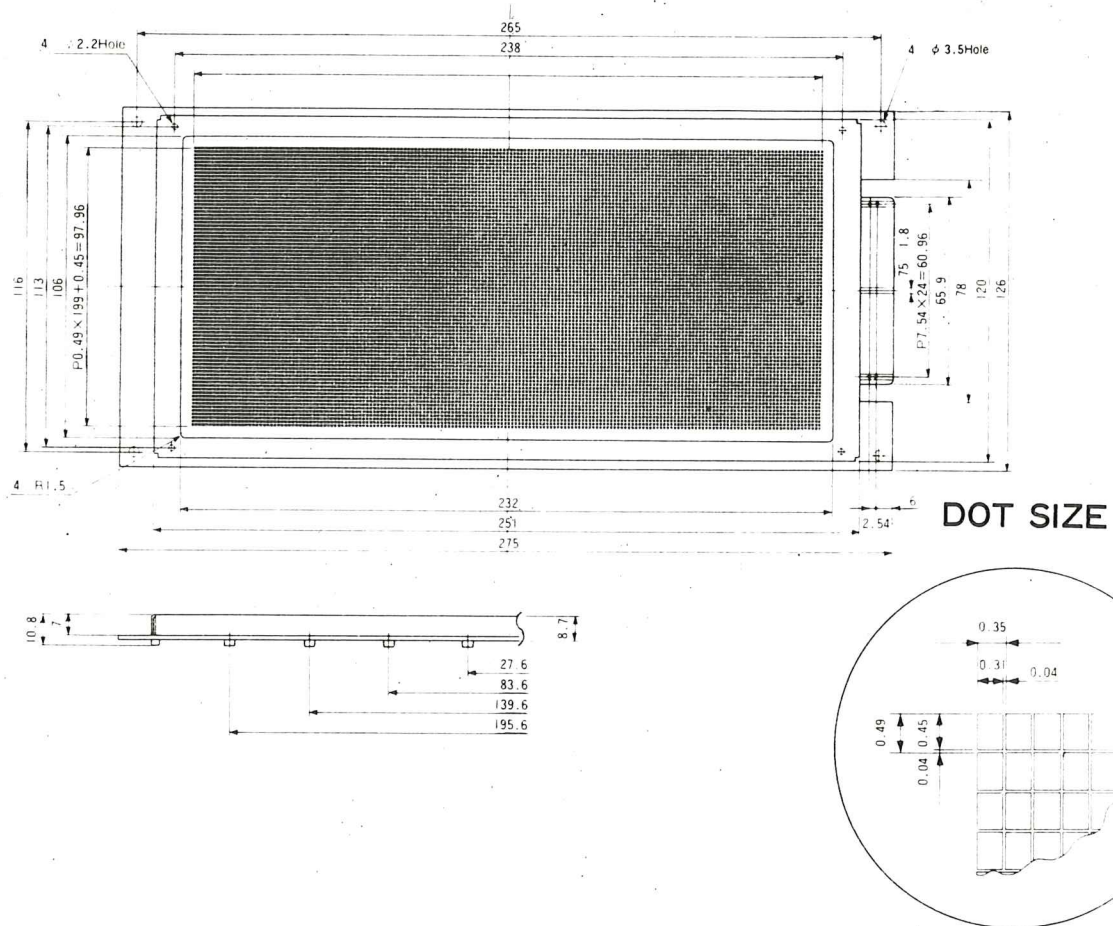
<Note2>  $V_D = 15.6V, \theta = 20^\circ$ 

### PIN ASSIGNMENT

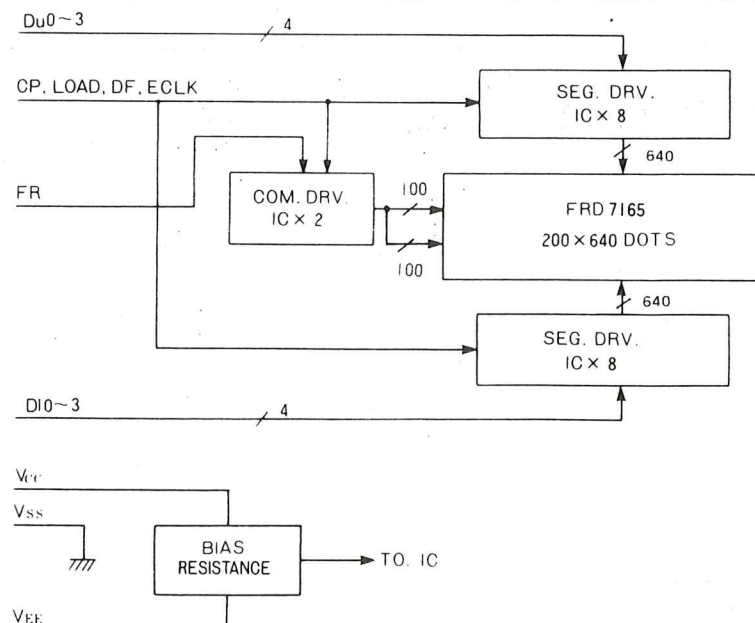
Pin No.	Symbol	Level	Function
1	NC	—	No Connection
2	FR	H	Frame Signal
3	LOAD	H→L	Data Latch Signal
4	CP	H→L	Check Signal for Shifting Serial Data
5	DF	H/L	Alternate Signal for LCD Driving
6	ECLK	H→L	Chip Select Signal
7	V <sub>CC</sub>	—	Power Supply for Logic Circuit
8	V <sub>SS</sub>	—	0 V
9	V <sub>EE</sub>	—	Power Supply for LCD Driving
10	DU 0	H/L	Display Data (Upper)
11	DU 1	H/L	Display Data (Upper)
12	DU 2	H/L	Display Data (Upper)
13	DU 3	H/L	Display Data (Upper)
14	DL 0	H/L	Display Data (Lower)
15	DL 1	H/L	Display Data (Lower)
16	DL 2	H/L	Display Data (Lower)
17	DL 3	H/L	Display Data (Lower)
18	—	—	No Connection
19	NC	—	No Connection
20	NC	—	No Connection
21	NC	—	No Connection
22	NC	—	No Connection
23	NC	—	No Connection
24	NC	—	No Connection
25	NC	—	No Connection



## EXTERNAL DIMENSIONS



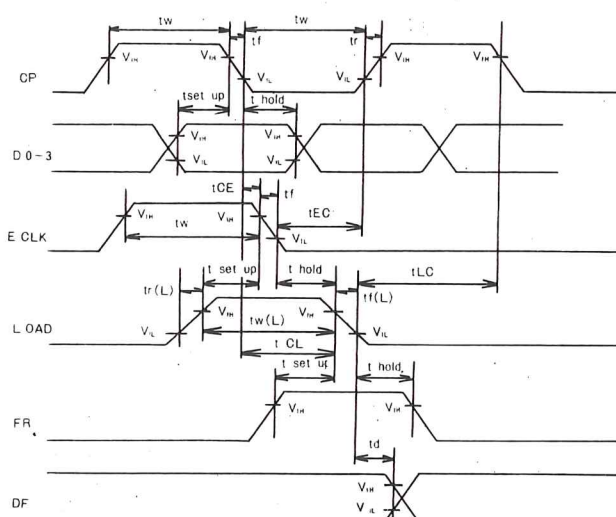
## BLOCK DIAGRAM



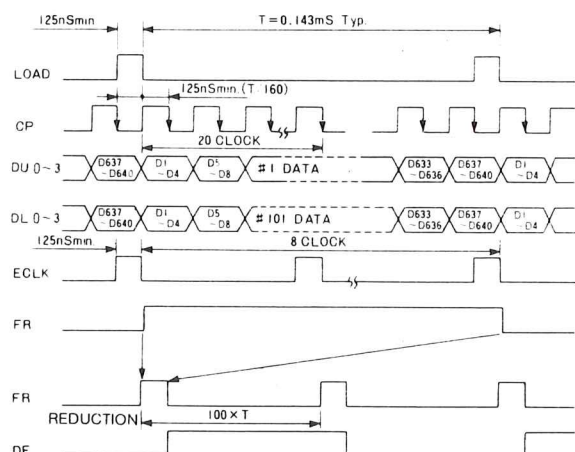
## TIMING CHARACTERISTICS

 $V_{CC} = 5V \pm 5\%$ ,  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ 

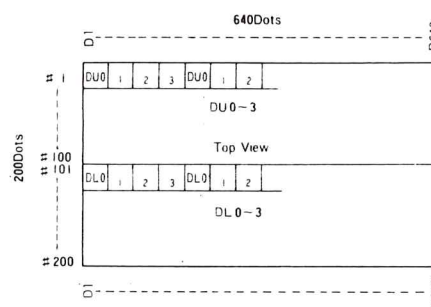
Item	Symbol	MIN.	MAX.	Unit
Clock pulse width (CP, ECLK)	tw	125	—	nS
LOAD Pulse width	tw (L)	125	—	nS
Set up time	t set up	100	—	nS
CP → LOAD time	t CL	250	—	nS
LOAD → CP time	t LC	0	—	nS
Hold time FR → LOAD CP → D0~3. ECLK → LOAD	t hold	100	—	nS
Rise time, Decay time	tr, tf	—	50	nS
LOAD Rise time, Decay time	tr (L), tf (L)	—	1	μS
CP → ECLK time	t CE	0	—	nS
ECLK → CP time	t EC	150	—	nS
DF Delay time	t d	—	± 1000	nS



## INTERFACE TIMING (DATA READ)



Comparison of display and data





# DMF631N (New TN Type, Built-in CCT Back Light)

## MECHANICAL DATA

Module Dimensions	275 × 140 × 18.5 mm
Active Viewing Area	224.0 × 98.0 mm
Dot Pixels	640 × 200 mm
Dot Size	0.32 × 0.46 mm
Dot Pitch	0.35 × 0.49 mm
Weight	570 g

## OPTICAL DATA

Ta = 25°C

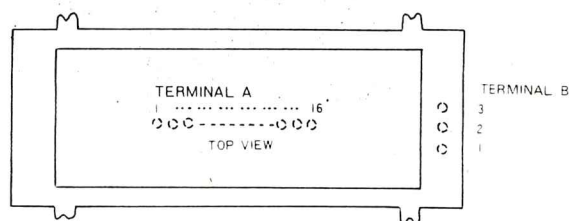
Item	Symbol	Condition	min	typ	max	Unit
Supply Voltage I/100duty (Vo)	V <sub>CC</sub> V <sub>EE</sub>	Ta = 0°C	15.6	16.8	17.8	V
		Ta = 25°C	14.2	15.3	16.2	V
		Ta = 50°C	12.7	13.7	14.5	V
Viewing Area	$\theta_2 - \theta_1$	CR = 2	-10	-	40	deg
Contrast ratio	CR	(Note1)	-	6	-	-
Response time (rise)	$\pi$	(Note2)	-	210	320	mS
Response time (decay)	$\tau_d$	(Note2)	-	220	330	mS

<Note1>  $\theta_2 = 20^\circ$ ,  $\theta = 0^\circ$ <Note2> V<sub>D</sub> = 15.6V,  $\theta = 20^\circ$ 

## ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	V <sub>CC</sub> ~V <sub>SS</sub>	—	-0.3	—	6	V
Supply Voltage (LCD Drive)	V <sub>CC</sub> ~V <sub>EE</sub>	—	0	—	22	V
Input Voltage	V <sub>I</sub>	—	-0.3	—	V <sub>CC</sub> +0.3	V
Operating Temperature	Top	—	0	—	+40	°C
Storage Temperature	Tstg	—	-20	—	+60	°C

## I/O TERMINAL



## ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Standard Value			Unit
			min	typ	max	
Supply Voltage (Logic)	V <sub>CC</sub> ~V <sub>SS</sub>	—	4.75	—	5.25	mA
Supply Voltage (LCD Drive)	V <sub>EE</sub> ~V <sub>SS</sub>	V <sub>CC</sub> = 5.0V ± 5% Ta = 25°C	—	—	14	V
Power supply	I <sub>CC</sub>	—	—	—	23	mA
Power supply	I <sub>EE</sub>	—	—	—	20	mA
Input Voltage "H" Level	V <sub>IH</sub>	"High" Level	0.8V <sub>CC</sub>	—	—	V
Input Voltage "L" Level	V <sub>IL</sub>	"Low" Level	—	—	0.2V <sub>CC</sub>	V
Clock Frequency	f <sub>CP</sub>	Duty = 50%	—	—	2	MHz

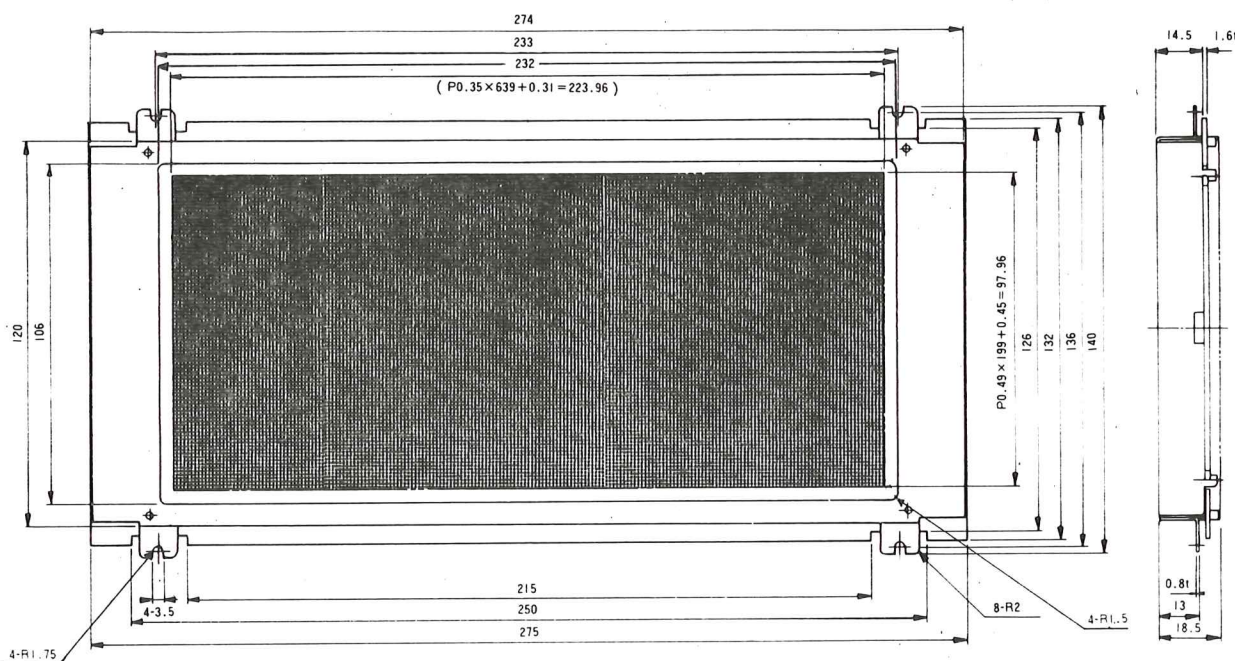
### TERMINAL A

No.	Symbol	Level	Function
1	FR	H → L	Frame Signal
2	LOAD	H → L	Data Latch Signal
3	CP	H → L	Check Signal for Shifting Serial Data
4	DF	H / L	Alternate Signal for LCD Driving
5	ECLK	H → L	Chip Select Signal
6	VCC	—	Power Supply for Signal
7	VSS	—	GND
8	VEE	—	Power Supply for LCD Driving
9	DU0	H / L	Display Data (Upper)
10	DUI	H / L	Display Date (Upper)
11	DU2	H / L	Display Date (Upper)
12	DU3	H / L	Display Date (Upper)
13	DLO	H / L	Display Data (Lower)
14	DLI	H / L	Display Data (Lower)
15	DL2	H / L	Display Data (Lower)
16	DL3	H / L	Display Data (Lower)
17~20	NC	—	No Connection

### TERMINAL B

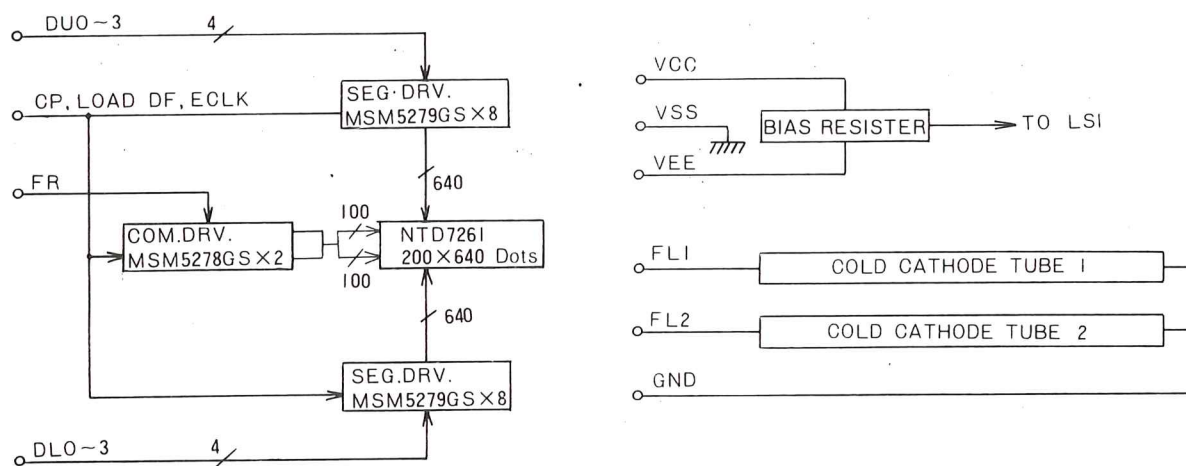
No.	Symbol	Level	Function
1	FL1	AC	Cold Cathode Drive Current
2	FL2	AC	Cold Cathode Drive Current
3	GND	—	Cold Cathode GND

## EXTERNAL DIMENSIONS



NOTE : VIEWING DIRECTION IS 12 : 00 O'CLOCK

## BLOCK DIAGRAM

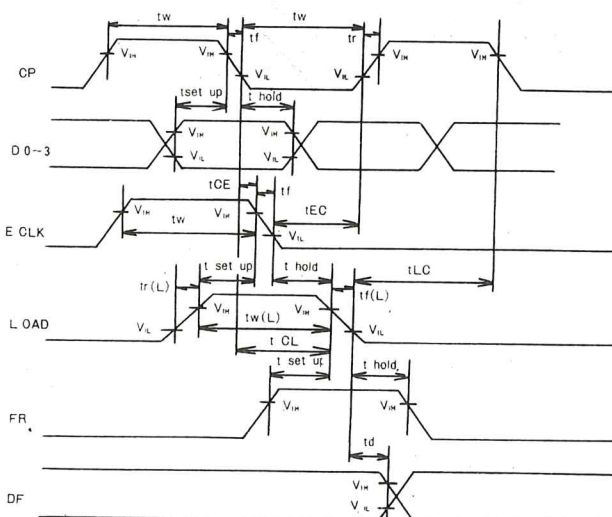




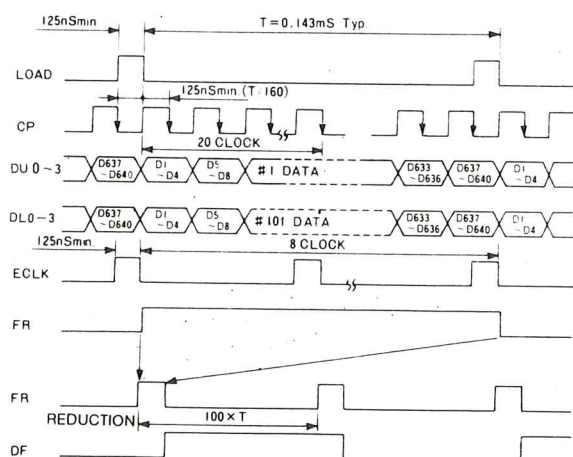
## TIMING CHARACTERISTICS

 $V_{CC} = 5V \pm 5\%$ ,  $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ 

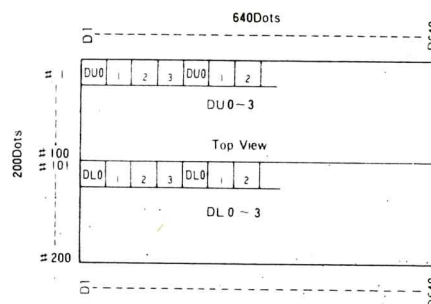
Item	Symbol	MIN.	MAX.	Unit
Clock pulse width (CP,ECLK)	tw	125	—	nS
LOAD Pulse width	tw (L)	125	—	nS
Set up	t set up	100	—	nS
CP→LOAD time	t CL	250	—	nS
LOAD→CP time	t LC	0	—	nS
Hold time FR→LOAD CP→D0~3. ECLK→LOAD	t hold	100	—	nS
Rise time, Decay time	tr,tf	—	50	nS
LOAD Rise time, Decay time	tr (L) tf (L)	—	1	$\mu\text{S}$
CP→ECLK time	t CE	0	—	nS
ECLK→CP time	t EC	150	—	nS
DF Delay time	t d	—	$\pm 1000$	nS



## INTERFACE TIMING (DATA READ)



Comparison of display and data





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